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Saskatchewan Agriculture, Food & Rural Revitalization

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Agri-ARM Program

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AgriARM
Applied Research Management

2002 Annual Report

Agri-ARM Program

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Conservation Learning Center, Prince Albert | East Central Research Foundation, Canora | Indian Head Agricultural Research Foundation

North East Agricultural Research Foundation, Melfort | Seager Wheeler Farm, Rosthern | South East Research Farm, Redvers

Western Applied Research Committee, Scott | Wheatland Conservation Area Inc., Swift Current

Agriculture, Food and Rural Revitalization

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CARDS

Agri-*ARM* 2002 Final Report

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Coordinator's Report and Program Overview

Jody McConnell

Agri-ARM is Saskatchewan Agriculture and Food's Applied Research Management program consisting of eight sites, and another six off-station sites, across the province representing all regions and soil conditions. The primary benefit is that this Program is producer driven and government backed. This enables the program to leverage funds from other jurisdictions and programs that would not be available to strictly government run program. The result is that Agri-ARM has been able to obtain funding from numerous external funding agencies and contributed to the development of the University of Saskatchewan's and Agri-Food and Agriculture Canada's research agenda. The involvement of producers and producer led organizations is pivotal to the success and adoption of research from these institutions.

Agri-ARM, through SAFRR funding, establishes a network of research sites by providing a stable core funding base for applied research managers at each site. The quality of people and the quality of work completed is pivotal to the ability of the sites to attract funding from external sources. It is because of the autonomous nature of the sites that funding and local support is obtained.

Although the Agri-ARM program is not quite a year old, it has made a significant contribution to changing how research is conducted in the Province. It has provided a focal point for researchers to communicate between institutions, and with producers. It is also providing a venue for these researchers to showcase their research to producers all across the Province in a very cost effective and efficient way. Over 5,000 producers attended field days and meetings where research was presented that was conducted at Agri-ARM sites.

The long term impact of the Agri-ARM program is potentially incredible. Producers are using Agri-ARM sites as a testing ground to analyze new technologies before personally adopting them. This creates an environment where producers are being exposed to numerous technologies and opportunities that they would not have previously been exposed to. The value in this is that producers can move towards 'regionalizing' the technology quicker, or determine if the technology is appropriate to their farming operation.

Figure 1. Agri-ARM site locations in Saskatchewan.

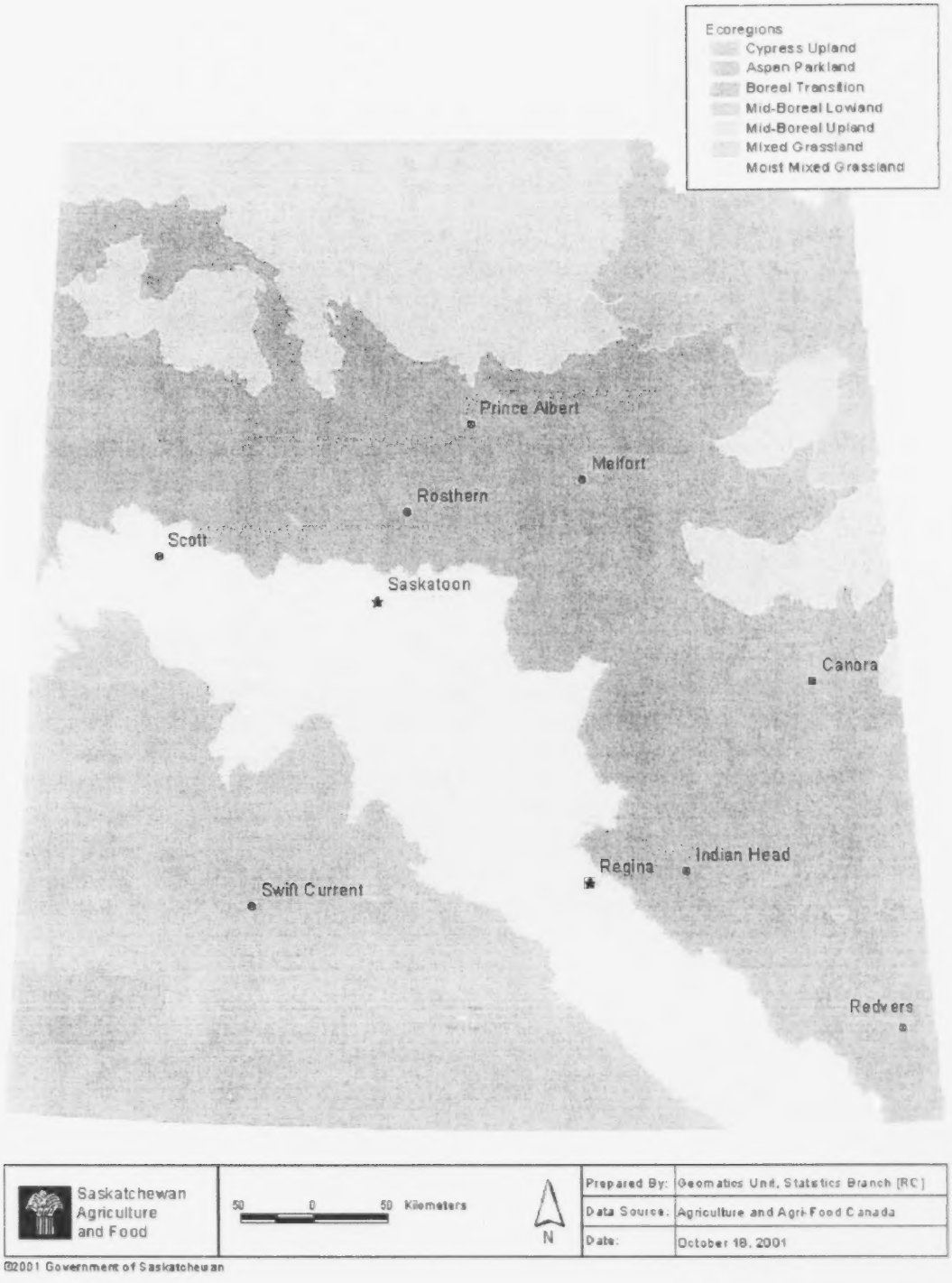


Figure 1. Agri-ARM site locations in Saskatchewan.

Table 1. Physical attributes of the Agri-ARM sites.

Site	Soil Climatic Zone[1]	Surface texture[2] and pH[3]	Average annual precipitation (mm)[1]	Average annual temperature (°C)[1]
Indian Head	Black	Clay to heavy clay; pH neutral to slightly alkaline	427	2.0
Swift Current	Brown	Silt loam; pH neutral to slightly acidic	380	3.2
Melfort	Moist Black	Clay to clay loam; pH slightly acidic	410	0.6
Canora	Moist Black	Silt loam; pH neutral to slightly alkaline	473	0.4
Redvers	Black	Loam; pH neutral to slightly alkaline	476	1.9
Scott	Moist Dark Brown	Loam; Slightly acidic to acidic	355	1.0
Prince Albert	Moist Black	Clay loam; pH neutral to slightly acidic	398	0.1
Rosthern	Black	Sandy loam; pH neutral to slightly acidic	375	1.2

[1] Soil Climatic Zones of Southern Saskatchewan. Saskatchewan Institute of Pedology and SAF. (*Humboldt data).
[2] pH of Saskatchewan Soils. Saskatchewan Institute of Pedology. SIP Publication M84/Agdex 530.
[3] Soil Landscapes of Canada – Saskatchewan. Agriculture Canada. Publication 5243/B.

Performance framework for Agri-ARM (2002-2007)

The objective of the Agri-ARM program is to conduct producer-driven applied research and demonstration, with results that extend beyond the farm gate to increase the value of crop production and improve agricultural sustainability.

The intent of Agri-ARM over a 10-15 year period is to improve farm profitability and increase agricultural producers' environmental stewardship. Outcomes chosen to influence long term goals are: new technologies and farming practices, public awareness of agriculture, improved decision making capacity and establishment of a research and development network. Outputs identified to influence outcomes are knowledge, information products and events, services and infrastructure.

The Framework of Agri-ARM

Impact (10-15 yr horizon)

Farm profitability
Increased wealth creation at the farm gate
Environmental stewardship
Agriculture as leader for improving soil, air and water quality

Outcome (5-7 yr horizon)

New technologies and farming practices
Increased adoption of new agricultural production technologies and practices by local farmers.

Public awareness of agriculture
Increased awareness by the general public of agriculture's role in environmental stewardship and the overall economy.

Improved decision-making capacity
Improved decision-making capacity by farmers for more environmental and economic on-farm options.

Research and development network
A network of applied research sites that is fully operational.

Reach

Primary clients
The direct beneficiaries
Farmers
General public
Commodity groups
Extension staff
Local agribusiness

Partners - funding and policy matters
Saskatchewan Agriculture, Food and Rural Revitalization
Agriculture and Agri-Food (Research and PFRA Branch)
University of Saskatchewan - College of Agriculture
Provincial Council of ADD Boards

Stakeholders
Those influenced by the program's outcomes

Output

Knowledge
New crops and crop varieties demonstrated
Information on new and innovative farming systems
New monitoring and diagnostic tools for production decisions
Regionally based scientific expertise

Information products/events

Services

Infrastructure

Activities

- New technology validation and demonstration
- Agriculture education for the public
- On-farm management decisions
- Effect applied research sites

CARDS Environmental Stewardship Survey Results

As part of a joint project with PCAB (Provincial Council of ADD Boards) and Agri-ARM, a producer survey was conducted at annual field days during the 2002 season. The objective of the survey was to raise awareness of environmental stewardship and environmental issues in agriculture. The survey had 292 participants from 8 Agri-ARM sites. The following figures illustrate the responses to the survey questions.

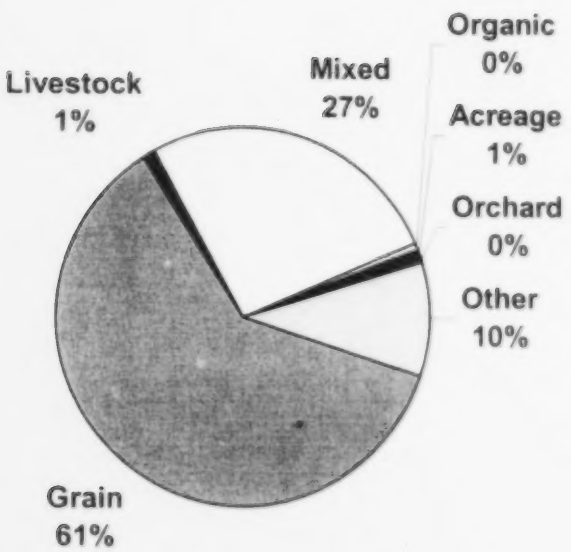


Figure 1. Survey Participant Agriculture Enterprise

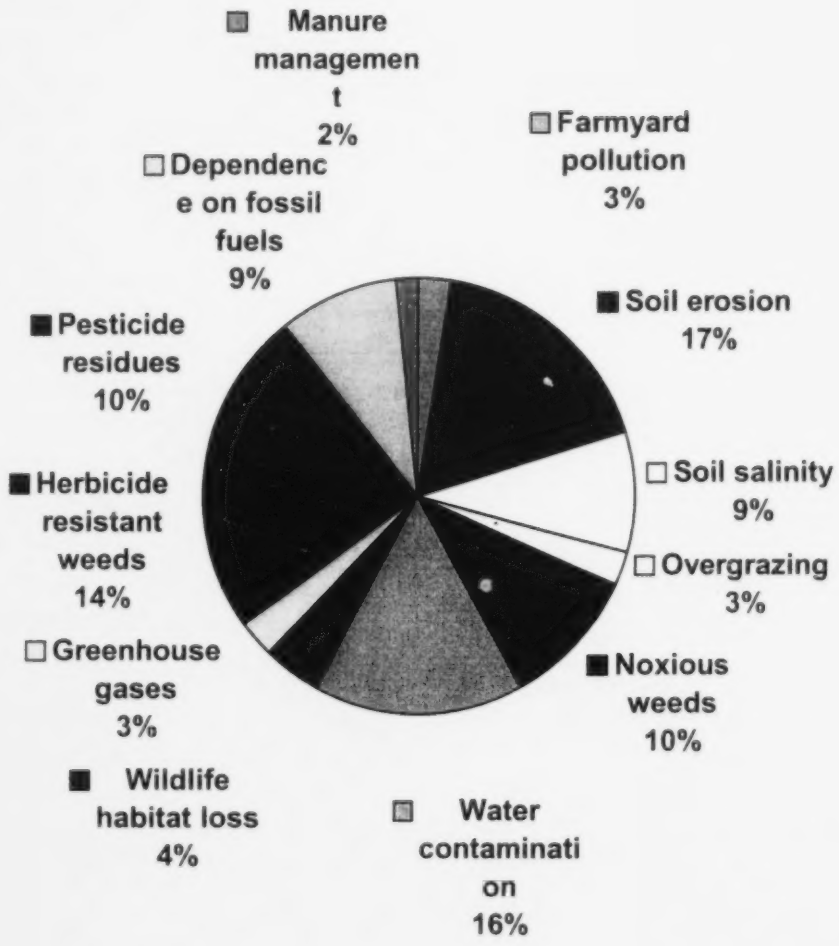


Figure 2. The four most important environmental issues.

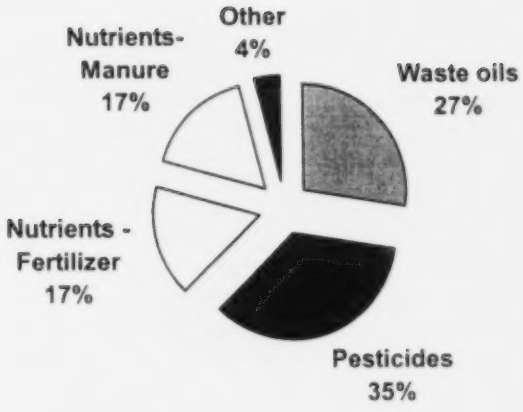


Figure 3. Greatest threat to water contamination.

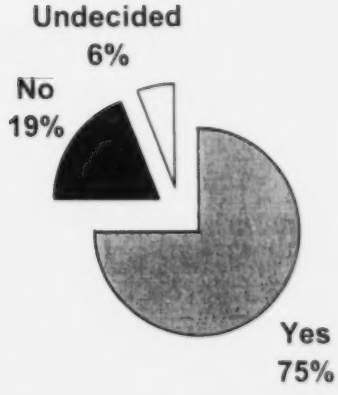


Figure 4. Are you infavour of voluntary environmental farm planning?

East Central Research Foundation

Canora

Manager - Scott Anderson P.Ag.

Agriculture, Development and Diversification Boards #12, 13, 18, and 19 joined to form the East Central Research Foundation (ECRF) in 1996. The ECRF encompasses 24 rural municipalities and a population of over 30,000 in eastern Saskatchewan. The ECRF is an incorporated organization overseen by an executive Board. The research farm is located on 185 acres west of Canora (W 25-30-04 W2) on land that is leased from the town. The ECRF is active in the surrounding community and receives various in-kind donations from elevator and chemical companies.

ECRF's mandate is to provide opportunities for local producers to examine new and innovative agricultural practices and to ensure local producers are supplied with applied research data directly related to the regional soils and climate.

A. Flax (*Linum usitatissimum*) Variety Evaluation for Fiber and Seed Production

B. Summary

The purpose of the study was to evaluate the performance of fiber flax varieties and oilseed flax varieties with regards to seed yield, and fiber quality. Eight specialty fiber varieties were grown and compared to two standard oilseed varieties (Vimy and Valour). The oilseed varieties had significantly higher yields and shorter crop height than most all of the fiber varieties. The fiber varieties had lower yields and taller growth habits in comparison to the oilseed varieties. The fiber varieties Evelin and Ilona had yields that would not be considered significantly lower than that of Valour although these two also exhibited a slightly shorter growth habit than the other fiber varieties. Fiber analysis of the varieties is pending.

C. Background and Objectives of Study

The quality of flax fiber produced in Saskatchewan using conventional varieties bred for seed production is quite poor in comparison to varieties used for the express purpose of fiber production. A large drawback of fiber varieties is that they are quite tall, are hard to cut and have relatively low seed yields. The potential for flax fiber processing in Saskatchewan is encouraging with various new markets in Asia opening up. The main block to this avenue is the low quality fiber currently produced and is considered more of a nuisance than an opportunity. The purpose of this study was to evaluate the potential of fiber flax varieties for seed production, while maintaining a high quality fiber for processing. If a fiber flax variety can produce similar yields to an oilseed variety there would be more incentive for producers to use these fiber varieties as they would not be facing such an economic loss through decreased seed yield potential.

D. Study Description

This study was conducted at Canora, Saskatchewan in the 2002-cropping season on a clay-textured soil in the moist black soil climatic zone. A randomized complete block design (RCBD) with four replicates was used consisting of 10 treatments. The eight fiber varieties were: Caesar Augustus, Diane, Diva, Electra, Escalina, Evelin, Hermes, and Ilona. Two oilseed varieties, Vimy and Valour, were used as checks. All treatments were seeded May 31 at a depth of one inch and a rate of 40 lbs/ac. All plots received 60 lbs actual N/ac in a side band at seeding. Plots were seeded with a row spacing of 6 inches to enhance fiber/stem uniformity. Parameters measured were; plant height, seed yield, and fiber quality. One set of straw samples was taken on Oct. 3 immediately after seed harvest and placed in the field to ret over winter, while another set was analyzed in a lab.

E. Results and Conclusions

Yields of the oilseed varieties were the two highest, which is an expected result as these varieties are developed for high production and low straw yield. Two fiber varieties, Evelin and Ilona, had slightly lower yields than these oilseed varieties, however these differences would not be considered statistically significant ($p<0.05$). Many of the fiber varieties did have significantly lower yields than the oilseeds, up to a 50% reduction, which would make them less attractive to producers as this represents a large reduction in income potential. The seed yield potential of these fiber varieties must be competitive with oilseed varieties if their adoption is to proceed, as this is the major source of income from the crop at this point. If the income potential for fiber increases from its current levels there may be incentive to switch to lower yielding crops, however at this point seed yield is of primary concern to producers.

The oilseed varieties had a significantly lower crop height than the fiber varieties and were much easier for the combine cutter bar to harvest. A general trend was seen with higher seed yields coming from the shorter crops and the very low yielding varieties had a significantly higher growth habit. The taller plants are very desirable for processors of the fiber as a longer fiber length is of much higher quality than that of the shorter varieties. The two fiber varieties with similar yields to the oilseed varieties were significantly shorter than the other fiber varieties but were still difficult to cut, demonstrating the higher fiber strength. The ease of harvest of some of the fiber varieties as they were quite resistant to cutting and hard on equipment would slow their adoption using conventional equipment, and alternative methods for seed harvest and straw treatment in the field should be investigated. The fiber quality analysis is pending and will be updated when it is completed.

Table 1. Mean seed yield and height data – Canora, 2002

Variety	Seed Yield (kg/ha)	Crop Height (cm)
Caesar Augustus	880 a	68 ab
Diane	1190 bc	64 bc
Diva	1250 cd	63 c
Electra	1000 ab	66 abc
Escalina	1250 cd	63 c
Evelin	1570 e	54 de
Hermes	1000 ab	69 a
Ilona	1440 de	58 d
Vimy	1880 f	51 e
Valour	1630 e	50 e
LSD	190	5

Means followed by different letters are significantly different ($p<0.05$)

F. Indication for Further Development

Based on data obtained from this site in 2002 there is sufficient yield potential with selected fiber varieties to maintain a satisfactory level of production. Issues with the ease of harvest have arisen as well as the optimal methods for which to harvest the seed and handle the remaining fiber. Further research would be advisable to determine if the fiber varieties produce consistent, high yields. There is also need for research into the most efficient way of handling the fiber in the field and methods of harvest, which will result in the highest quality of this fiber. There is promise in the markets for the development of the flax fiber industry, and in time the value of the fiber from the crop may exceed that of the seed. The development of methods to handle these fiber varieties while maintaining seed yield potential will have a large impact in improving the production and profitability potential of flax producers.

G. Information on Performance Indicators

Diversification in crops and now into the value added sector of agricultural production is of vital importance for the long-term viability of prairie agriculture. The developing flax fiber market is an excellent opportunity for prairie producers to increase their production potential with a crop that is currently being grown. This research is important to provide an information source for producers to utilize in the effort to capitalize on this new opportunity in the flax fiber production industry while minimizing risk to current seed production.

A. Effect of Seed Placed and Side Banded Potash on Barley (*Hordeum vulgare*)

B. Summary

The purpose of this study was to evaluate the performance of barley (cv. Metcalfe) with increasing rates of seed placed and side banded potash (KCl) fertilizer. Treatments consisted of rates from 0 to 60 actual lbs/ac of K side banded, seed placed, and treatments with potash both side banded and seed placed. No significant differences were observed between any of the treatments in this study. The barley was not affected by seed placed levels of 60 lbs actual K/ac, and there was no yield reduction or significant change in plant nutrient levels. It is important to note that there was excellent soil moisture present at seeding. Plant tissue and seed tests measured no differences in K and Cl levels for the treated and untreated control units. Spring soil tests indicated sufficient levels of both nutrients, making a significant response unlikely. Tests conducted on a soil deficient in these nutrients would be more likely to elicit a significant response. More data is needed in this area, especially since the soil tends to be alkaline with a pH value ~ 8.5, limiting availability of these nutrients.

C. Background and Objectives of Study

Potassium (K) and Cl (chloride) are essential nutrients for plant growth and require attention when addressing crop fertility needs. Saskatchewan soils are typically high in K and Cl levels; however there are becoming more soils displaying deficiencies, especially in the north and on sandy or sandy loam soils with high pH levels (>8.0). The use of potash fertilizer has received more attention pointing towards potential benefits as, improved disease resistance, straw strength, and increased test weight to name a few. This study was designed to determine the tolerance of barley to the application of increasing rates of potash fertilizer, both in the seed row and side banded. Plant response to the applied nutrients will be compared to that of plants receiving no KCl fertilizer.

D. Study Description

The study was conducted at Canora, Saskatchewan in the 2002-cropping year on a clay soil in the moist black soil climatic zone. A randomized complete block design (RCBD) with three replicates was used consisting of ten treatments. All treatments received 50 lbs actual N/ac in a side band (SB), and 20 lbs actual P/ac seed placed (SP). The treatment effect being measured was KCl fertilization level and placement. Treatments were as follows with amounts in actual pounds per acre: 0 KCl, 20 KCl (SP), 20 KCl (SB), 40 KCl (SP), 40 KCl (SB), 60 KCl (SP), 60 KCl (SB), 10 KCl (SP) + 10 KCl (SB), 20 KCl (SP) + 20 KCl (SB), 30 KCl (SP) + 30 KCl (SB). The barley was seeded on May 24 at 72 lbs/ac and a depth of one inch into excellent seedbed moisture. The crop was tissue tested at flag leaf to determine both K and Cl levels in both the unfertilized check and the treatment receiving 20 KCl (SB). Crop heights and yields were measured on all treatments, with a seed sample tested from both the check and 20 KCl (SB) to determine harvest levels of K and Cl.

E. Results and Conclusions

There were no significant differences in yield or crop height among the treatments in the study. Spring soil test levels of K and Cl were at or above levels considered sufficient for crop production making a response to applied nutrients unlikely, though considering a pH value of 8.5, interference of nutrient uptake would still be possible. The plant tissue tests taken from the check receiving no KCl fertlizer at flag leaf had levels of K and Cl that were the same as that of the KCl fertilized treatment. The fertilized treatment had slightly elevated levels of Cl, however this had no effect on crop growth. The seed samples displayed no differences between the check and fertilized treatment in K or Cl levels. There were no noticeable differences seen in any aspect of crop growth between treatments throughout the growing season. The treatments receiving 40 and 60 KCl with the seed would be exceeding safe rates of fertilizer with the seed, as 50 actual pounds is considered the maximum safe amount of combined phosphate and potash in a cereal crop. The clay-textured soil combined with excellent soil moisture levels at seeding would contribute to lessen any possible seedling damage due to excess fertilizer levels. In the conditions experienced this year there were no advantages realized by the application of potash fertilizer on the barley crop.

Table 1. Mean yield and height data – Canora, 2002

Treatment	Yield (kg/ha)	Crop Height (cm)
0 K	3740	82
20 K (SP)	3310	83
20 K (SB)	3500	85
40 K (SP)	3670	83
40 K (SB)	3770	87
60 K (SP)	3680	88
60 K (SB)	3550	77
10 K (SP) + 10 K (SB)	3750	78
20 K (SP) + 20 K (SB)	3400	83
30 K (SP) + 30 K (SB)	3200	78
LSD	NS	NS

Table 2. Tissue and seed test nutrient levels – Canora, 2002

Treatment	Plant Part	K (%)	Cl (ppm)
Check	Whole plant	3.59	14,300
20 K (SB)	Whole plant	3.59	16,500
Check	Seeds	0.56	1,140
20 K (SB)	Seeds	0.59	1,130

F. Indication for Further Development

Based on results from this study it appears that barley has a high tolerance to seed placed potash fertilizer. The crop does not show any significant response to additions of potash fertilizer when the soil levels are at or above sufficient amounts for production. Further research could be done on soils showing K or Cl deficiencies to better evaluate the impact of supplemental KCl fertilization. There would be more opportunity to evaluate the impacts of K and Cl fertility on crop growth in a deficient situation.

A. Evaluation of yield and feed potential of warm vs. cool season annual forages

B. Summary

The purpose of this study was to determine the production potential of various species of annual forage with early and delayed seeding. The species evaluated were C4 plants (millet, sorghum sudangrass), and cool season C3 plants (oat, barley, triticale) to determine the potential of the relatively untested C4 plants in the east-central region of Saskatchewan. The early seeding date for the foxtail millets and sorghum sudangrass had a significantly higher biomass accumulation than the C3 species, while the delayed seeding date had the same trend. . A trend of slightly higher relative feed values (RFV) was seen in the delayed seeding date across all species in the study. The cool season crops did not show any significant variation in dry matter yield between the two seeding dates, while there was a significant decrease in dry matter yield with the C4 species (except sorghum sudangrass) with delayed seeding vs. early seeding. The C4 plants show slight accumulations of nitrates in both seeding dates, which are undesirable but can be managed with proper rationing. This study shows that with sufficient heat units the C4 plants have a good production potential, although they show lower feed values in comparison to crops like oat and barley.

C. Background and Objectives of Study

Recent years of drought experienced across the prairies have limited the production potential of perennial forage stands, making the use of annual forages as a source of green-feed necessary. The common crops used as annual forage have been cereals such as oat, barley, and triticale, however there is increasing interest in the use of crops with higher production potential. These C4 plants, which use a different photosynthesis pathway than the more common C3 plants, are more drought tolerant and have a higher inherent biomass accumulation potential. The C4 plants do need much higher temperatures for optimum growth than the C3 plants, making their potential in a cool wet summer less than hot and dry. There has not been a lot of work done with these C4 species in Saskatchewan to determine their potential as a forage source, and the Agri-ARM program has addressed this by conducting this trial evaluating the performance of various C3 and C4 species. Both the biomass yield will be examined as well as the feed quality and nitrate accumulations of both types of plant to determine their potential as a livestock feed source.

D. Study Description

The study was conducted at Canora, Saskatchewan in the 2002 cropping season on a loam textured soil in the moist black soil climatic zone. A randomized complete block design (RCBD) with four replicates was utilized. Two seeding dates were used, May 14 and June 14, with the same 12 species seeded on both dates. Varieties used on both seeding dates with seeding rates and depths are in table 1 below. All treatments were seeded into summerfallow at both dates, and all crops, except fababean, received 40 lbs actual N/ac side banded. All treatments received 20 lbs actual P/ac seed placed and the

fababeans were inoculated with a self-stick peat inoculant. Crops were sampled for biomass at the optimal stage for each specific crop, with the cereals at soft dough, and millets at heading. Fababean was sampled when pods were filled and the sorghum sudangrass when the latest millets had headed as it did not head out. All plots were measured for crop height, biomass, and a composite sample was taken across all reps for each treatment to analyze the feed value of each treatment.

Table 1. Crop seeding rate and depth – Canora, 2002.

Crop	Seeding Rate (lbs/ac)	Seeding Depth (inches)
Fatima Fababean	120	1.5
AC Pinnacle Oat	114	1.5
Ranger Barley	100	1.5
Sandrow Triticale	120	1.5
AC Prairie Gold Proso Millet	30	0.5
Golden German Millet	20	0.5
Strain R German Millet	20	0.5
White Wonder Foxtail Millet	20	0.5
Siberian Red Foxtail Millet	20	0.5
Mil-Hy 300 Pearl Millet	30	0.5
Megagreen Sorghum Sudangrass Hybrid	20	0.5
Crown Millet	20	0.5

E. Results and Conclusions

The C4 species had a significant increase in biomass accumulation in comparison to the C3 species in the May 14 seeding date. The oat, barley, and triticale reached their optimal timing for cutting just over a month before the millets were ready to be cut, giving the C4 crop more growing days and moisture to utilize. The C3 species and the earlier millets such as crown and proso were cut on July 30, while the foxtail and german millets were cut on September 3 and August had a high rainfall amount of 3.6 inches for the month, while there was only 5.2 inches from seeding to August 1. The longer growth period of these treatments was an advantage in this season leading to the large increase in biomass over the cereals. The sorghum sudangrass had the highest dry matter yield, however the plant exhibits quite a woody stem and palatability to livestock would be a concern. All the C4 species had nitrate levels close to 1% with the pearl millet and crown millet at 2%. These nitrate levels are considered high and there may be concerns with livestock reaction to these
levels.

The June 14 seeding date had a reduction in the dry matter yield of the foxtail and german millets in comparison to the early seeding date. The oats, barley, and triticale had increases in comparison to the earlier seeding date as they were not cut until late august, and they were able to utilize the moisture received in that month. There was still a slight

increase in dry matter yield of the millets and sorghum sudangrass in comparison to the cereals, with the exception of Ranger barley, which yielded as well or better than all of the millets. The millets were cut just into September and did not have as long a growing season as the first seeding date of the millets had, which would explain the reduction in dry matter accumulation. The feed values of the millets were still lower in comparison to the cereals, and still had the high levels of indigestible fiber. Nitrate levels of 1% up to 2% were also present in all the C4 species while the cereals were at or below 0.6%. The delayed seeding did not have a negative effect on the C3 species; however the reduction in growth period coupled with lower temperatures experienced in the last few weeks did have a significant impact on the C4 species yield reduction. One exception to this trend was the sorghum sudangrass, which did not exhibit a yield reduction in the delayed seeding vs. the early seeding date. The palatability and high nitrate levels of this species would limit its viability in a livestock production system.

The C4 plants have a much higher dry matter yield but they are composed of more indigestible fiber making their feed value lower than the cereals in the study. Livestock would become satiated on less intake, however there would be less energy per unit in the feed making this feed not well suited to situations where growth is to be encouraged. There is potential for these C4 crops such as the german and foxtail millets to provide good amounts of feed in a dry year; however the feed value is indeed lower than traditional cereals. These C4 species may be more suited to a situation where maintenance of the animal is more of a priority than the growth. This study did not show any significant advantages to delayed seeding, however if there is risk of frost in an area the C4 plants should be seeded when there is minimal risk as they have a very low tolerance to frost.

Table 2. May 14 seeding date yields and feed values. (all data expressed on a 100% dry matter basis)

Crop	Harvest Date	Yield (tons/ac)	Relative Feed Value	Nitrate (%)
Fatima Fababean	September 3	3.00 de	112	0.00
AC Pinnacle Oat	July 30	2.48 bcd	107	0.30
Ranger Barley	July 30	2.35 bcd	108	0.66
Sandrow Triticale	July 30	2.09 b	98	0.21
AC Prairie Gold Proso Millet	July 30	2.22 bc	86	1.30
Golden German Millet	September 3	4.95 g	77	0.88
Strain R German Millet	September 3	3.98 f	83	1.35
White Wonder Foxtail Millet	September 3	4.65 fg	71	1.04
Siberian Red Foxtail Millet	August 7	N/A	82	1.18
Mil-Hy 300 Pearl Millet	September 3	3.26 e	87	2.04
Megagreen Sorghum Sudangrass Hybrid	September 3	5.70 h	92	0.82
Crown Millet	July 30	2.35 bcd	85	2.06
LSD		0.72		

Yields followed by different letters are significantly different ($p<0.05$)

Table 3. June 14 seeding date yields and feed values. (all data expressed on a 100% dry matter basis)

Crop	Harvest Date	Yield (tons/ac)	Relative Feed Value	Nitrate (%)
Fatima Fababean	September 16	2.66 ab	145	0.00
AC Pinnacle Oat	August 20	2.71 ab	87	0.33
Ranger Barley	August 29	3.48 c	113	0.65
Sandrow Triticale	August 29	2.34 a	101	0.30
AC Prairie Gold Proso Millet	August 20	2.78 ab	90	0.96
Golden German Millet	September 16	3.49 c	80	1.51
Strain R German Millet	September 16	3.22 bc	95	1.10
White Wonder Foxtail Millet	September 16	3.70 c	86	1.07
Siberian Red Foxtail Millet	August 20	2.83 ab	84	1.51
Mil-Hy 300 Pearl Millet	September 16	3.50 c	85	2.12
Megagreen Sorghum Sudangrass Hybrid	September 16	5.87 d	86	1.62
Crown Millet	August 20	2.78 ab	81	1.81
LSD		0.68		

Yields followed by different letters are significantly different ($p<0.05$)

F. Indication for Further Development

Based on results from Canora in 2002 it would appear that there is potential for use of C4 plants, specifically the german and foxtail millets, as annual forages. Further work would be advisable to determine whether these crops will perform like this on a regular basis, and if the feed values and nitrate levels are typical of what was seen this year. The C3 plants studied provided more than acceptable dry matter yields and very good feed quality, showing why they are good sources of emergency forage. More work would help to determine what role, if any, these C4 plants can play in a livestock production system.

G. Information on Performance Indicators

With recent issues of drought and the corresponding reduction in perennial forage production potential there has been an increase in the use of annual forages. These C4 crops are relatively new to producers in Saskatchewan and not a lot is known about their production potential and feed quality. This research aids in building a database of information for producers to utilize in their decision process when selecting crops to use in an annual forage production system.

A. Pesticide Free Production Trial/Demonstration

B. Summary

The purpose of the study was to evaluate the impact of seeding rate, and in-crop herbicides on the yield of hard red spring wheat, field pea, and oilseed flax. Plots receiving herbicide in-crop were seeded at standard seeding rates, while those without an in-crop application were seeded at 125% of standard seeding rates. The trial was conducted at Canora, SK in 2002 on a clay loam soil with a moderate to high population of weeds. An in-crop application of herbicide significantly increased yield compared to unsprayed, even with the higher seeding rate used. Crop growth was noticeably impaired in plots with no herbicide application and some height reduction in the crop was noticed due to increased weed competition. Increasing seeding rate is not an effective replacement for an in-crop application of herbicide in a direct seeding system with moderate, to high native weed populations.

C. Background and Objectives of Study

Pesticide free production is a system where no pesticides may be used from the time of crop emergence to the time the crop is removed from the field, including fungicides. The ability to use inorganic fertilizers as well as pre-emergent applications of non-residual chemicals (ie. Glyphosate) give the producer the potential for good production in the absence of pesticides. The elimination of pesticide use is aimed to reduce input costs, lessen the amount of pesticides entering the ecosystem, and develop a new market for the grain produced. This production system is relatively new to the prairies and agronomic methods are still being evaluated. This study is aimed at increasing the knowledge base for this practice, also to increase awareness of this new production system. Increasing the seeding rate of the various crops, to replace the pesticide, is designed to evaluate this practice for improved crop competition with weeds to maintain yield potential of the crop.

D. Study Description

The study conducted at Canora, Saskatchewan in 2002 utilized a randomized complete block design (RCBD) with four replicates. Six treatments were used consisting of: wheat seeded at 90 and 113 lbs/ac, field pea seeded at 220 and 275 lbs/ac, and oilseed flax seeded at 45 and 56 lbs/ac. All wheat and flax plots received 60 lbs/ac Nitrogen, and 20 lbs/ac Phosphate, while all pea plots were inoculated and received 20 lbs/ac Phosphate. All nitrogen was side-banded one inch below and one inch to the side of the seed row at seeding while all phosphate was seed-placed. All plots received two pre-seeding burn-offs with Roundup Transorb @ 0.5 L/ac each time. Plots with the lower seeding rates received in-crop applications of herbicide at the appropriate staging with the crop specific herbicides, while the plots with higher seeding rate were not treated with pesticides in-crop. Parameters measured on the crops were: plant density, plant height, and grain yield.

Table 1. Mean data and significant differences

Crop	Seeding Rate (lbs/ac)	Herbicide	Plants/m row	Crop Height (cm)	Yield (kg/ha)
Wheat	90	Yes	49	71	3280
Wheat	113	No	58	68	2220
Pea	220	Yes	14	58	2960
Pea	275	No	16	51	2050
Flax	45	Yes	147	55	1890
Flax	56	No	181	51	1230
LSD $p<0.05$			NS	NS	300

E. Results and Conclusions

The increased seeding rates did give plant stands, in the unsprayed plots, approximately 120% over the sprayed plots. There was a general trend shown of decreased crop heights in those plots with no weed control, although not considered statistically significant ($p<0.05$). The decreased crop height would be a result of increased crop competition from weeds. The weeds would be competing with the crop for available nutrients making less available for the crop to utilize in its growth. Plots receiving herbicide exhibited no injury due to the chemicals and had excellent weed control enabling the crop to grow free from weed pressure.

Yield had a significant increase with the application of chemical in all crops studied. All crops had almost 50% yield improvement with the application of the appropriate in-crop herbicide. The weed populations in this field would be characterized as moderate to high, making it more difficult for the crop to develop unabated by weed pressure. The increasing of seeding rate did not result in the same effect as an in-crop herbicide application, and would not provide an economic gain. The PFP method would also lead to increased seed stores of noxious weeds in the soil seed bank making successive years in this field more difficult to manage. PFP would be a practice more suited to a field rotation in which perennial forage was included in an effort to lower weed populations before implementation.

F. Indication for further development

Based on results obtained from this site in 2002 in moderate to high weed pressures, increasing seeding rate will not impact yield sufficiently to replace an in-crop herbicide application. Further work with seeding rate modification in a PFP system would be best suited on fields with lower weed pressures. Many other factors such as cropping rotation would have more impact on the feasibility of the PFP system in this setting.

G. Information on performance indicators

The development of the PFP concept is an important step in the reduction of pesticide use in prairie agriculture. With the impending development of a PFP market class for grains there may be added incentive for producers to cut their pesticide use, thereby decreasing the amounts of chemical being placed into the agricultural ecosystem, while still enabling them to use inorganic fertilizers to maintain yield potential. This research aids us in developing an agronomic data base for producers to utilize in their adoption of this practice in our province.

A. Applied Research/Demonstration of Hog Manure as a Fertilizer Source in East-Central Saskatchewan

Scott Anderson, ECRF Farm Manager

B. Summary

The project was designed to evaluate the usefulness of hog manure in an annual cropping system and to investigate potential nitrogen losses through leaching. The study used three rates of hog manure applied in spring of 2000, compared to granular fertilizer, an unfertilized check, and a summerfallow treatment. Barley was seeded in the year of application, canola was seeded the following year unfertilized, and barley was sown the year following with no fertilizer. Yield with the hog manure was slightly lower in the year of application with the 6000 and 9000 GPA treatments due to excessive lodging problems, although the crop performance in the second and third year was much better on those two treatments over granular and unfertilized plots. Movement of nitrates through the soil profile was very similar in both manure and granular nitrogen treatments, with the largest levels of available nitrate staying in the top foot of soil. This study has shown the use of hog manure in an annual cropping system to be a viable option in the east central region.

C. Background

The loss of the WGTA has led to increased opportunities for intensive livestock production in Saskatchewan. With a sparse population density, and a large land base for potential hog manure application, this province is a logical place for hog production to increase. The east-central region in particular, with its high freight costs and relative abundance of feed grains, is very well suited to hog production. How these operations will affect both surrounding crop growth and possibly groundwater sources are issues require attention. This project was established to provide a local and unbiased information source regarding these issues.

Project Objectives

1. To provide producers with locally based, unbiased information on the value of hog manure as a fertilizer source.
2. To address concerns that hog manure has a negative impact on crop growth.
3. To investigate potential nitrogen losses through leaching.
4. To improve the public's perception of the hog industry.

D. Study Description

The project was set up using a randomized complete block design (RCBD) consisting of the following treatments: Spring 2000 manure application at rates of 3000, 6000, and 9000 gallons/acre, granular nitrogen rates of 50, 100, 150 lbs actual N/acre, unfertilized check, and a summer fallow treatment. The manure used in 2000 was analyzed at Enviro-Test laboratories and was shown to provide an equivalent of 30lbs N/1000 gallons. The trial consisted of four replicates. The granular nitrogen treatments of urea were side banded and included 25lbs P_2O_5/acre seed placed and 15 lbs K_2O/acre side banded. The summer fallow treatment was tilled in the 2000 cropping year and cropped in 2001 and 2002. Plots were sown to two-row malt barley (c.v. Metcalf) in 2000. Fall soil tests were taken to four feet from each treatment in 2000 to determine if nitrogen was moving downwards through the soil or if it was remaining in the crop rooting zone. All plots were sown to argentine canola (c.v. LL 2633) in 2001 and received no fertilizer, with yields being recorded and fall soil tests conducted on all treatments to assess available nitrate levels in the soil up to a four foot depth. The plots were seeded to barley in 2002 (cv. Metcalf) and received no fertilizer, with yields recorded to assess lasting fertility impacts from the manure.

E. Results and Discussion

Yield Impacts

	Mean Yield (kg/ha)		
Treatment	2000 – Barley	2001 – Canola	2002 – Barley
Summerfallow	N/A	800 ab	3210 bc
Check – no fert.	3880 a	640 a	2390 e
3000 GPA	5700 d	1110 c	2610 de
6000 GPA	5080 b	1580 d	3510 b
9000 GPA	4850 b	1600 d	4590 a
50 N, 25 P, 15 K	5000 bc	990 bc	2640 de
100 N, 25 P, 15 K	5680 d	1040 bc	2680 de
150 N, 25 P, 15 K	5620 cd	1070 c	2920 cd
LSD	660	250	360

Means followed by different letters are significantly different ($p<0.05$)

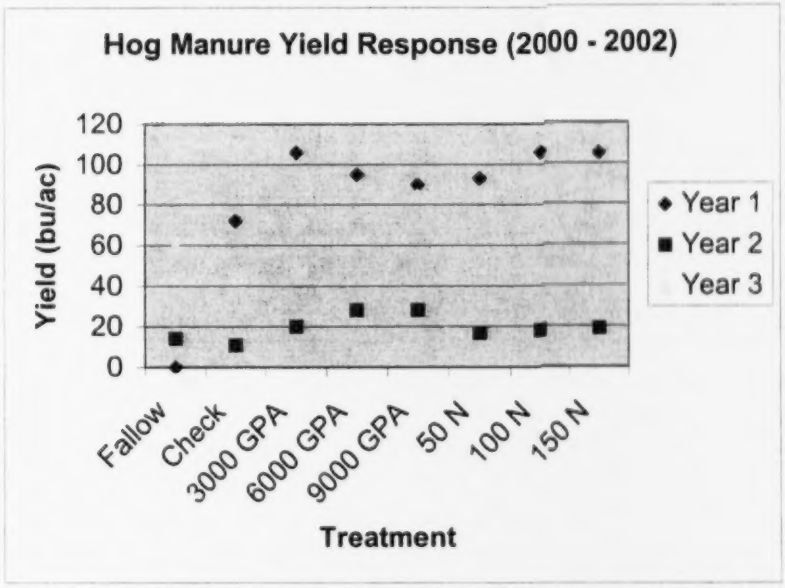
In all years the unfertilized check treatment had a significantly lower yield than all other treatments, which was to be expected. In the first year of the study yields were significantly higher with the 3000 GPA treatment over the higher levels of manure. During the 2000 growing season there was crop lodging experienced in the higher manure treatments due to heavy rains and winds, which would explain some decreased yield numbers. The granular nitrogen treatments in 2000 would suggest that the 100 lbsN/ac rate would maximize returns using granular fertilizer, as the 150 lbsN/ac had a

slightly decreased yield. In the year of application it would appear that the 6000 and 9000 GPA rates provided more than sufficient levels of fertility, which led to the lodging problems. The 3000 GPA rate was equivalent to the 100 lbsN/ac rate of granular nitrogen.

The 2001 crop was seeded with no fertilizer added to any of the treatments to assess the residual fertility from the previous year's treatments. During the growing season visible differences existed in growth among treatments. The unfertilized check had a very poor stand and yield correspondingly was lowest. The summerfallow plot did not show a statistically significant increase over the unfertilized check, or the 50 and 100 lbN/ac granular nitrogen treatments ($p<0.05$). The 3000 GPA treatment did not differ significantly from any of the granular nitrogen treatments although it was still significantly higher than the summerfallow and unfertilized check. The 6000 and 9000 GPA treatments had significantly better plant stands and plant quality through the year and both had significantly higher yields than all other treatments. Yield in 2001 may have been affected by a hail event on August 7th, however with the yields showing expected trends the differences seen are likely due to treatment effects.

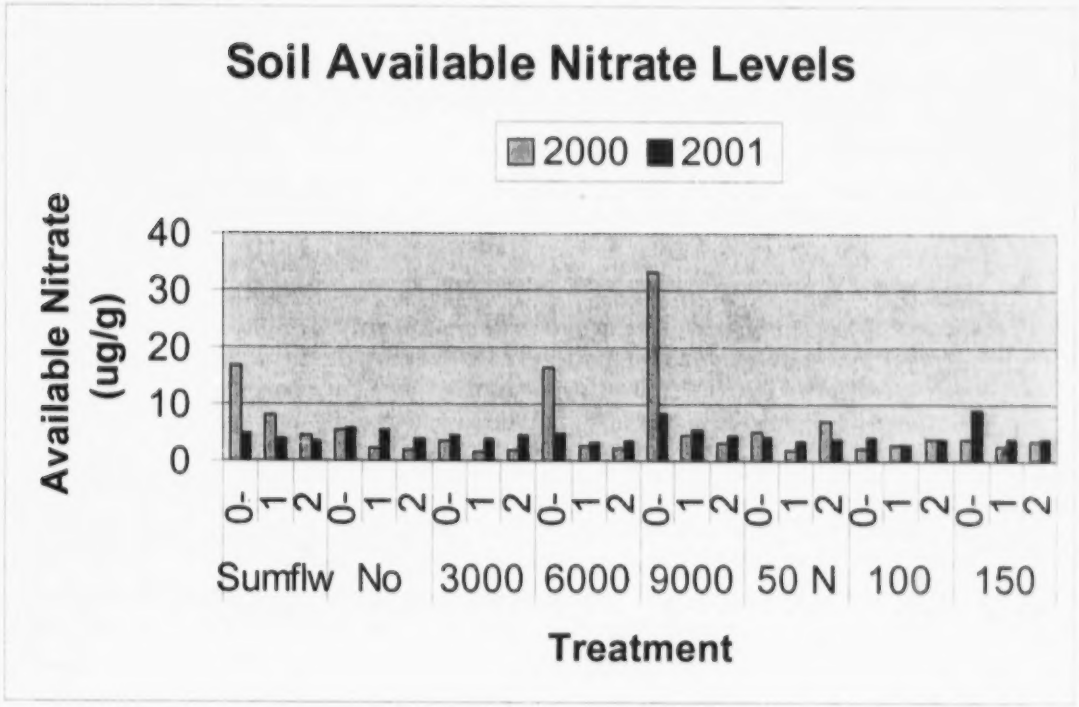
The 2002 barley crop was seeded with no fertilizer and again there were visual differences in growth. Significant increases were seen in the 6000 and 9000 GPA treatments over all other plots. The 9000 GPA treatment yielded at 157% of the highest nitrogen treatment. No significant differences in yield were observed among the granular fertilizer treatments, the summerfallow, or the 3000 GPA. The high rates of hog manure provide sufficient levels of nutrients to grow three crops per one application. It would be reasonable to say that there was not a problem with the nutrients leaching out of the rooting zone, if the plots are still showing the effects of the application two years later.

The yield advantages from the high applications of hog manure in the two years following the first would more than make up for the slight yield depression seen from the lodging in the first year. The economic benefits of using hog manure are evident as with an application cost of $15.00 per acre, regardless of amount injected, and being able to produce three good crops off of this one application at the higher rates. The manure provided sufficient levels of nutrition to the crops in all aspects as no deficiency symptoms appeared.



Soil Nitrate Levels

Soil tests for each treatment were collected in fall of 2000 and 2001. The cores were separated into three depths, 0-12, 12-24, 24-48 inches, and analyzed for available nitrate levels. A general trend existed where the highest nitrate levels were in the 12" and lower levels as depth increased. In the year of application, the 6000 and 9000 GPA treatments had high levels of available nitrate in the top foot but levels below that did not have much higher levels than the granular nitrogen. The absence of elevated available nitrate levels at depth on the treatments decreases the likelihood of groundwater contamination due to the application of hog manure. Growing season precipitation was greater in 2000 than in 2001: 277.1 and 160.2 mm respectively. This study was conducted on a clay loam soil and leaching was not a problem, however on a very sandy soil with higher rainfall, leaching could possibly become an issue. The hail event in 2001 might have impacted soil nitrate values but due to the consistency of the data, the treatment effects are reiterated. By the second year of the study the nitrate levels in fall were very similar in both the hog manure and granular nitrogen treatments.



E. Conclusions

Based on the three years of data from this study, hog manure proves to be an excellent source of fertility for crop growth with similar leaching properties of granular nitrogen products. The slight depression in yield experienced in the year of application, due to excessive fertility and lodging issues, on the higher rates of hog manure was offset by the improved performance of the crop in the second year of the study. The one application of the 6000 and 9000 GPA treatments proved to be sufficient for three cropping years, making it a very economically viable option for producers. Groundwater nitrate contamination from these application amounts is unlikely as the available nitrates stayed in the top foot of the soil and did not leach appreciably through the profile. This study has shown the use of hog manure as a source of fertility in an annual cropping system to be an economically and environmentally sound practice in the east central region. Research on this practice is ongoing to confirm the findings from this project.

2002 Field Season - Tour Summary

East Central Research Foundation – Canora, SK

The Agri-ARM program is focused on facilitating interaction among producers, industry, researchers, and government in research and demonstration activities. An important aspect of this facilitation is through the various field tours throughout the growing season for producers, and the various other entities to meet and have an exchange of information. The East Central Research Foundation is located at Canora, Saskatchewan, a member of the Agri-ARM program, and as part of the program, has hosted various field days to aid in the process of this technology transfer to area producers. The various tours held at the site in 2002 included: (number of people in attendance)

- June 12- Preeceville school agriculture 20 class (11)
- June 19- SAFRR Forage and Livestock Field Day (45)
- June 29- Australian farm operator tour (3)
- July 5- SAFRR Agrologist update field tour (12)
- July 8- Winter Cereals Canada board of directors tour (9)
- July 17&18- Saskatchewan Wheat Pool agronomist diagnostic school (100)
- July 25- ECRF Annual field tour (100)
- Sept. 24- Israeli plant breeder tour (4)

The large annual field day held in July provides an invaluable source of information to producers, researchers, and government as it provides a venue where all are present and an open exchange of information is available. Trials discussed and the people presenting were as follows:

- Sunflower variety testing – Cliff Powlowski (AAFC)
- Terramax soybean testing – Hugh Campbell (Terramax Seeds)
- Dry bean regional variety trial – Dr. Bert Vandenberg (CDC)
- Cereal nitrogen response on various stubbles – Dr. Brian McConkey (AAFC)
- Hog manure fertility trials – Ernie Patrick P.Ag. (Big Sky Farms)
- Perennial forage production – Wally Vanin P.Ag. (SAFRR)
- Annual forage production – Wally Vanin P.Ag. (SAFRR)
- Oat variety testing – Dr. Brian Rossnagel (CDC)
- Green fallow testing – Scott Anderson A.Ag. (ECRF)
- Field pea inoculant performance testing – Hannah McIver (Agri-biotics)
- Direct seeding trials – Juanita Polegi P.Ag. / Travis Goebel P.Ag. (SSCA)
- Specialty oil canola testing – Shane Lacusta CCA (Cargill Ltd.)
- Commercial cereal variety tests – Lorraine Beaudette / Mike Grenier M.Sc. (CWB)
- Fiber flax variety evaluations – Alvin Ulrich M.Sc. (Biolin)
- Pesticide free production systems – Jody McConnell M.Sc. (SAFRR)

The field days are important in providing the various people in agriculture an opportunity to access resources they may use to aid in future endeavors.

A. Green fallow termination evaluation of field pea (*Pisum sativum*), chickling vetch (*Lathyrus sativus*), and canola (*Brassica napus*).

B. Summary

This study was conducted to evaluate the impact of different termination methods on green fallow crops on the crop growth in the re-crop year. Crops in the study included; pea (cv. Swing), chickling vetch (cv. AC Greenfix), and canola (cv. LL2573). The 2002 cropping year was designed as a preparation year for growing these three crops and carrying out termination at mid-flower by both tillage and herbicide, while taking some plots to yield. The three crops were selected to simulate crop response on a heavy feeding, non-N fixing crops' stubble (canola), a common pulse crop (field pea), and a crop bred for the specific purpose of green manuring. The results from the wheat re-crop in 2003 will provide the information on which crop and method of termination provides the most beneficial response.

C. Background and Objectives of Study

The increasing cost of nitrogen fertilizer is leading to the search for cheaper fertilizer alternatives, such as the use of a legume. For producers with a summerfallow operation in their rotation there is the option of using a legume during a short period of the fallow period to fix a large amount of atmospheric N and enriching the soil organic matter content. The inherent advantage of these organic forms of nitrogen is that they are not subject to the leaching losses and are made available for the plant throughout the growing season. The risks of inorganic fertilizer overuse, such as salinity, leaching, and heavy metal contamination (Cadmium) may also be somewhat reduced by lessening the use of these products. The use of a green fallow crop is also very well suited to an organic production system by increasing the production capability through the symbiotic atmospheric nitrogen fixation process. This study is being conducted to evaluate this method of fallow replacement in the east-central region of Saskatchewan.

D. Study Description

The study is being conducted on a clay loam soil in the moist black soil climatic zone in Canora, SK. A randomized complete block design (RCBD) with four replicates is used, consisting of 9 treatments. Three crops with three different treatments are being used: canola, chickling vetch, and field pea are the crops with one plot of each taken to yield, one terminated at mid-flower by tillage, and one terminated at mid-flower by herbicide. Tillage was done with a light duty cultivator, with two passes to incorporate the plant material. Herbicide termination was done with an application of glyphosate in the form of Roundup Transorb at a rate of 1L/ac. Seeding rates were 5 lbs/ac for canola, 220 lbs/ac for pea, and 140 lbs/ac for the chickling vetch (seeding rate for vetch 70 lbs/ac, but seed lot had only 47% germ). Both pulses were inoculated with a peat inoculant and fertilized with 20 lbs/ac of P in the seed row, while the canola received 70 N, 20 P, and 10 S with the N and S side-banded and P seed-placed. Date of termination was recorded, and yield data collected from those plots taken to maturity.

E. Results and Conclusions

Main body of results to be gathered after 2003 growing season, where wheat will be seeded on plots seeded in 2002. Parameters to be measured are plant density, height, grain yield, and grain protein. The establishment of plots in the 2002 growing season was satisfactory with all treatments within each crop showing equivalent plant densities.

F. Indication for further development

Yet to be determined.

G. Information on performance indicators

Yet to be determined.

A. Timing of Burn-off with Roundup in Direct Seeded Field Pea (*Pisum Sativum*)

B. Summary

This study was conducted to assess the tolerance of field pea (cv. Swing) to glyphosate up to 3 days after crop emergence. Glyphosate was applied using Roundup Transorb @ 0.5 L/ac rate using a flat fan nozzle and a water volume of 45 L/ac. Applications included pre-seeding, pre-emergence and four post-emergent applications of the glyphosate. The stage determined to be emergence was not visible from any distance as the plants were just breaking through the surface of the soil (ground crack), and it is important to note that not all the plants had emerged at this point (~50%). The treatments receiving glyphosate more than 24 hours after emergence exhibited gnarled root masses, poor crop vigor and low yields in comparison to those treatments at or before emergence. It would not be recommended to apply glyphosate at any point following emergence in field pea.

C. Background and Objectives of Study

The use of spring glyphosate burn-offs in a direct seeding system is of vital importance in the successful control of noxious weeds in the absence of mechanical tillage operations. The timing of burn-off is optimal if performed as close as possible to seeding or before crop emergence, however environmental conditions may make application impossible to do at the desired time. This study was conducted to determine if field pea would be tolerant if the application had to be delayed until after the crop had begun to emerge. If the crop was found to be tolerant at these very early growth stages then it may be possible to still make an application and avoid having excessive weed pressures develop before the crop was at a stage where an in-crop application of herbicide would be possible.

D. Study Description

The study was conducted at Canora, Saskatchewan in the 2002-cropping year on a clay loam soil in the moist black soil climatic zone. A randomized complete block design (RCBD) with three replicates was used consisting of six treatments: pre-seeding application, pre-emergence, ground crack, ground crack +24 hrs, ground crack + 48 hrs, and ground crack + 72 hrs. All treatments consisted of an application of Roundup Transorb @ 0.5 L/ac and a water volume of 45 L/ac using a flat fan nozzle. Field pea (cv. Swing) was seeded on May 24 @ 180 lbs/ac at a depth of one inch. All treatments were inoculated with a liquid inoculant and also received 20 lbs P/ac seed placed. Ground crack was classified as the time when approximately 25-50% of the crop was just breaking the surface of the soil. It is important to note that no above ground growth was visible from any distance until the last two application timings 48-72 hours following initial emergence.

E. Results and Conclusions

The treatments receiving glyphosate more than 24 hours past initial ground crack had large yield reductions in comparison to all other treatments. The ground crack and crack + 24 hours did not show yield decreases but it is important to note that less than half of the plants were emerged and there was very little of the plant above ground, probably 2 to 3 millimeters or less. The latter two treatment timings had more plants emerged and those that were up were showing up to 1 centimeter of above ground growth. The latter two treatments had decreased crop vigor, and the rooting systems of these plants were severely gnarled with little nodulation. The early treatments likely did not exhibit, as much damage due to the small percentage of the crop showing and what was up would not have much of any area for the spray to contact and enter the plant. If emergence is visible to the naked eye then the crop is likely too far advanced to make an application of glyphosate without injury. Field pea does not show acceptable tolerance to applications of glyphosate after it has emerged from the ground.

Treatment	Date Sprayed	Yield (kg/ha)
Pre-Seeding	May 24	2210
Pre-Emergence	May 26	2180
Ground Crack	June 3	2140
Ground Crack + 24 hrs	June 4	2170
Ground Crack + 48 hrs	June 5	1450
Ground Crack + 72 hrs	June 6	1170
		NS

F. Indication for Further Development

Based on results obtained from this site in 2002 it appears that field pea does not exhibit acceptable tolerance to glyphosate after emergence. It would not be advisable to apply glyphosate after field peas have emerged as severe crop damage and yield reductions may occur. There does not seem to be reason for further investigation into field pea tolerance to glyphosate as it has shown that the levels are unacceptable.

G. Information on Performance Indicators

The use of a spring burn-off application of glyphosate is a common and much needed practice on most land under a direct seeding production system. Environmental factors may make this spring application difficult to perform in a timely fashion leading to the application coming in a pre-emergent timing as opposed to pre-seeding. This study has shown that it is very important to do this application before any appreciable emergence of field pea to avoid crop injury due to application of glyphosate.

A. Winter cereal establishment on annual forage stubble

B. Summary

The study was designed to evaluate the success of winter cereal establishment in the same cropping year as annual forage species. Annual forage species used included cereals, millets, faba bean, and sorghum sudangrass, with various cultivars within each species being evaluated for biomass production and feed values. The establishment of winter wheat was performed to evaluate the impacts of each of these species impact on water usage, nutrient cycling, and weed and disease cycles in the subsequent crop. The species (e.g. millet) had increased biomass accumulation in comparison to the C3 species (e.g. Barley, oat, faba bean). The establishment of winter wheat on these forage stubbles in fall of 2002 was deemed to be satisfactory, however the amount of snowfall to provide winter cover will be a large factor in decreasing the chance of winterkill. The production potential of the C4 plants is superior to that of C3 species providing adequate moisture and heat units are received, however the re-cropping potential with C4's is not known in our cropping area.

C. Background and Objectives of Study

The practice of winter cereal production has several inherent benefits to both producer and wildlife. Winter cereal benefits include: increased water use efficiency, decreased pesticide usage, and decreased wildlife disturbance to name a few. Increasing issues with drought problems in Saskatchewan are leading to decreased production of perennial forage stands, making the use of annual forage sources an important alternative feed source. With the decreasing levels of annual moisture and higher average temperatures experienced, the use of plants more adaptable to drought conditions, such as C4's is showing potential. This study was conducted to both evaluate the performance of these C4 species in comparison to conventional C3 crops and to observe the following crop response by establishing winter wheat on the annual forage crop stubble in the same year as the forage production.

D. Study Description

The study was established at Canora, Saskatchewan in the 2002 cropping year. A randomized complete block design (RCBD) with four replicates was used consisting of 16 treatments. The treatments in this study were the different species of annual crop: faba bean, oat, barley, foxtail millet, annual ryegrass, proso millet, pearl millet, and sorghum sudangrass. The crops were seeded on May 14 with all crops receiving 40 lbs/ac N in a side-band and 20 lbs/ac P seed-placed, with the exception of faba bean as it was inoculated and received the seed-placed phosphate. Crops were cut for feed and removed from the plots at the appropriate staging for each species: soft dough for cereals, early heading for the millets. Crops such as sorghum sudangrass and pearl millet that did not head out were cut at the same time as the foxtail millets. Winter wheat (cv. Raptor) was seeded into the stubbles on September 11, 2002 at a rate of 100 lbs/ac receiving only

20 lbs/ac of seed-placed P. Parameters measured on the winter wheat will be plant density, weed density, crop height, yield, and protein.

E. Results and Conclusions

The biomass accumulation of the C4 plants was significantly higher than that of the C3 plants. The cereal species reached their optimal timing for forage harvest (soft dough) at a relatively early stage in comparison to the majority of the C4 species (early heading) with the exception of Crown, Siberian Red, and Proso Millet. The later maturity of the millets allowed them approximately 35 days more of production allowing the plant to accumulate much more biomass. Many of the C4 plants also had a much taller growth habit than the C3 species.

The increased biomass and length of growth period in the C4 plots would lead to the conclusion that there will have been more removal of both moisture and fertility reserves from the soil in comparison to the C3 plants. The re-cropping of winter wheat on these stubbles should provide much insight regarding impacts on moisture and fertility cycling. The re-cropping effects of these C4 plants will have a large impact on determination of their viability in a modern production system.

Table 1. Mean values and LSD's – Canora, 2002

Species	Dry Matter yield (tons/ac)	Height (cm)	Days to Harvest
Fatima Fababean	3.00 de	104 ef	112
AC Pinnacle Oat	2.48 bcd	100 d	77
Triple Crown Oat	2.82 cde	101 de	77
Baler Oat	3.24 e	115 g	77
Ranger Barley	2.35 bcd	81 a	77
Yorkton Barley	2.73 bcde	86 b	77
Sandro Triticale	2.09 b	89 bc	77
Sorghum Sudangrass	5.70 h	204 l	112
Annual Ryegrass	1.36 a	90 c	77
Proso Millet	2.22 bc	106 f	77
Golden German Millet	4.95 g	124 l	112
Strain R Millet	3.98 f	105 f	112
White Wonder Millet	4.65 fg	136 j	112
Siberian Red Millet	.	120 h	85
Pear Millet	3.26 e	140 k	112
Crown Millet	2.35 bcd	125 i	77
LSD	0.72	3	

F. Indication for further development

The results obtained to this point show that the use of these C4 species is a viable production alternative to current use of cereal crops as an annual forage source. The re-crop of winter wheat will provide invaluable data on the impacts that these species will have in a direct seeding system. If the cropping of winter wheat on these stubbles is successful there may be need for further work on different crop types to follow these C4 species in a rotation to ensure that there are no inter-species difficulties in production.

G. Information on performance indicators

There is increasing call to diversify into growing winter wheat for economical and environmental reasons. By conducting research to evaluate not only the production potential of different species as forage, which are drought tolerant and their resulting impact on winter wheat establishment there is a dual benefit to producer and wildlife. This research will aid in establishing a source of agronomic information for producers to utilize in their evaluation and possible adoption of these species and production methods.

Indian Head Agricultural Research Foundation
Indian Head

Bill May - Manager

In 1990, a group of Indian Head area farmers along with researchers from the AAFC - Indian Head Research Farm gathered together to discuss areas of cooperation in the agricultural research field. The farmers formed a group to become known as the Indian Head Agricultural Research Foundation (IHARF). IHARF was incorporated in July of 1993 and is directed by a 9-member Board of Directors.

The mission of IHARF is to promote profitable and sustainable agriculture by facilitating research and technology transfer activities for the benefit of its members and the agricultural community at large

In 1997, IHARF purchased 310 acres of land just east of the Indian Head Research Farm for the Centre of Excellence for Precision Farming Research. IHARF also has a partnership with the Saskatchewan Soil Conservation Association (SSCA) for technology transfer. The Farm is also an important satellite sight for the Flax Breeding Program of the University of Saskatchewan Crop Development Centre.

IHARF Agronomy Research Update - Fall 2002

This was the second year of our durum trials. We had experiments at Indian Head, Swift Current and Melita, MB. The objective of this work is to provide farmers with better information on how to manage their protein and control disease in durum. Moderate levels of disease occurred at Melita. Low disease levels were observed at Indian Head and very low levels of disease were observed at Swift Current. The yields ranged from 40 to 60 bu/acre at Indian Head, 15 to 30 bu/acre at Swift Current and 14 to 25 bu/acre at Melita. A brief update should be available by the annual meeting in January.

Two oat agronomy projects were initiated this year in collaboration with Steve Shirtliffe, and Chris Willenborg at the University of Saskatchewan and Martin Entz at the University of Manitoba. They both investigate the management of wild oat in tame oat. One study examines the effect of seeding rate and seeding date on the competitiveness of tame oat vs wild oat. This study is at three locations, Winnipeg, Indian Head and Saskatoon. The other study looks at the effect of wild oat emergence relative to tame oats and will be conducted at Indian Head and Saskatoon. This last study will be Chris Willenborg's master's project. In addition, I submitted an application to SAF's ADF for new oat funding to look at the combined effect of phosphorous and seeding rate on the competitiveness of tame oat in the presence of wild oat. Phosphorous promotes early season growth and at plots I toured in Brandon it appeared that the addition of phosphorous with the seed reduced the wild oats in the plots. This may have been may imagination hopefully I will be able to obtain funding to find out.

Canaryseed research was limited to investigating the control of Septoria leaf mottle with fungicides and herbicide testing. The herbicide testing went well and I should have some interesting results to report.

The first Agri-Arm project was initiated and investigated the suitability of warm season grasses for swath grazing at Indian Head, Redvers and Canora. Lorne Klein with SAFRR started this project and hopes to expand to most Agri-Arm sites next year. Also, a research proposal has submitted to SAFRR's ADF on sunflower agronomy (See Sunflower stretegic planning session for more information) and IHARF has been listed as a sit for several Argi-Arm research proposals submitted to SAFRR's ADF.

This research is funded by Indian Head Agricultural Research Foundation, Agriculture and Agri-Food Canada's Matching Investment Initiative, Saskatchewan Department of Agriculture, Food and Rural Revitalization, Western Grains Research Foundation, Westco, Agrium, Bayer, Syngenta, Quaker oats, Can-Oat Milling and Quality Assure Seeds

A. Improving the Quality and Profitability of Durum Wheat through Nitrogen and Disease Management

B. Summary

Durum wheat markets demand assurance of minimum quality standards. The overall objective is to develop knowledge that will permit durum producers to implement crop and soil fertility management strategies geared to, improving grain quality, grain protein, yield and achieving a higher grade for the grain they produce. The results from the first year have been completely analysed and the results form the second year are currently being measure and analysed. Therefore no major results or conclusions can be drawn at this time. Applying all the nitrogen at seeding provided the most consistent increases in protein. However, when the yield potential increased during the growing season as it did at Swift Current in 2002 protein levels in the durum seed where increased when nitrogen was top dressed during the growing season.

C. Background and Objectives of Study

Durum wheat markets demand assurance of minimum quality standards. Grain protein is one of the most important determining durum wheat quality, and durum markets consistently demands a protein content of 13% or higher, for which industry pays a premium. Since the early 1990s, the average protein content of CWAD has been 12.5% or less, leaving a sizeable proportion of the durum crop unsuitable for the premium market. As a result other durum producing countries, mainly the United States and Australia, have increased their share of the international market at our expense.

The reduction in protein content of the durum crop has been attributed to higher levels of precipitation in the Brown and Dark Brown soils zones concomitant with a decline in soil available nitrogen. In the Thin Black soil zone inadequate nitrogen supplies have also affected kernel quality, becoming a major degrading factor, with the concomitant decline in returns to the farmer. Under the moister conditions experienced in the past decade, leaf spotting diseases, kernel diseases - particularly red smudge and black point- and fusarium head blight have become more prevalent. These diseases have played an important role in contributing to lower grain yields and substantial downgrading of CWAD.

Crop management techniques that allow producers to maximize the probability of obtaining a significant protein premium and minimize the probability of their durum crops being downgraded will have a significant effect on their net return.

The overall objective is to develop knowledge that will permit durum producers to implement crop and soil fertility management strategies geared to, improving grain quality, grain protein, yield and achieving a higher grade for the grain they produce. Two experiments are being used to develop this knowledge and their specific objectives are:

1) To determine effect and relative efficiency of top-dressed N on yield, grain protein, quality and economic return of durum wheat.

2) To determine the effect of plant density, nitrogen supply, fungicide treatment, and cultivar on grain quality, grade protection and economic return

D. Study Description

STUDY #1 Effect and relative efficiency of top-dressed N on yield, grain protein, quality and economic return of durum wheat.

Cultivars of CWAD wheat will be grown with a basal N application at seeding that will provide the crop with 75% of the available N (soil NO_3-N plus fertilizer N) required to achieve maximum yield and protein. Top-dressed N treatments will be superimposed on this basal N application and will consist of a full factorial combination of the following factors:

I) Nitrogen application rates: 20, 40, and 60 kg N ha^{-1}.
II) Time of topdressing: five-leaf, flag-leaf, and anthesis growth stages
III) CWAD cultivars: AC Avonlea, AC Morse, AC Navigator, Kyle.

As control for each cultivar, a set of plots will be fertilized at seeding with the basal N application plus 0, 20, 40, and 60 kg N ha^{-1}.

Locations: Indian Head and Swift Current, SK

All plots will receive a blanket application of P, K, and S to ensure these nutrients will not limit crop growth. The experiment will be replicated four times. This design will allow us to determine the direct effect of top-dressed N on grain yield protein and quality parameters, and to assess the efficiency of top-dressed N relative to a similar amount of N applied at seeding.

STUDY #2 Effect of plant density, nitrogen supply, fungicide treatment, and cultivar on grain quality, grade protection and economic return.

This study will consist of factorial combination of the following factors

I) CWAD cultivars:	AC Avonlea, AC Morse, and AC Navigator
II) Plant density:	recommended seeding rate, and 2 x recommended seeding rate
III) Nitrogen:	fertilizer N required to raise N available to the crop (soil NO_3-N plus fertilizer N) to level required for optimum yield and protein, and N equivalent to the average application rate used by producers in the region.
IV) Fungicide	None, Tilt at flag leaf emergence, Folicur at flag leaf emergence, and Folicur at anthesis

The crop will receive a blanket application of P, K, and S at rates that will ensure these nutrients will not limit its growth. The experiment will be replicated four times.

Locations: Indian Head, SK, Swift Current, SK and Melita, MB

Proposed measurements: soil nutrient status to 60 cm before seeding, plant density, heads m^{-2}, plant height, lodging, days to heading, disease, grain yield, Hard Vitreous Kernels (HVK), Protein Content, Test Weight, Moisture Content, Kernel Weight, visual down grading factors (ergot, black point, red smudge, midge damage, and fusarium). An economic analysis will be conducted once the data has been collected.

E. Results

The second of three seasons has been completed. The results from the first year have been completely analysed and the results form the second year are currently being measure and analysed. Therefore no major results or conclusions can be drawn at this

time. In general increasing the rate of applied nitrogen increased the protein content of the durum. Applying all the nitrogen at seeding provided the most consistent increases in protein. However, when the yield potential increased during the growing season as it did at Swift Current in 2002 protein levels in the durum seed where increased when nitrogen was top dressed during the growing season.

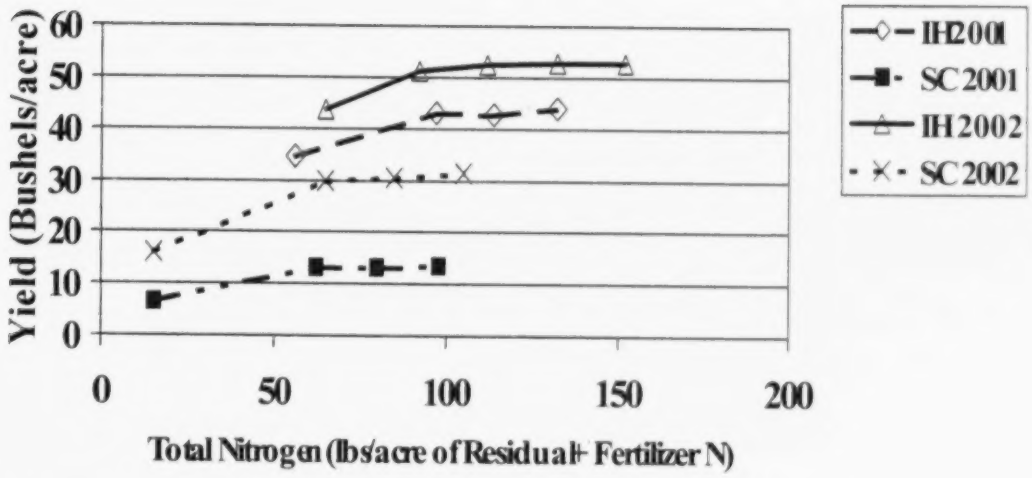


Fig 1. The effect of nitrogen on the yield of durum

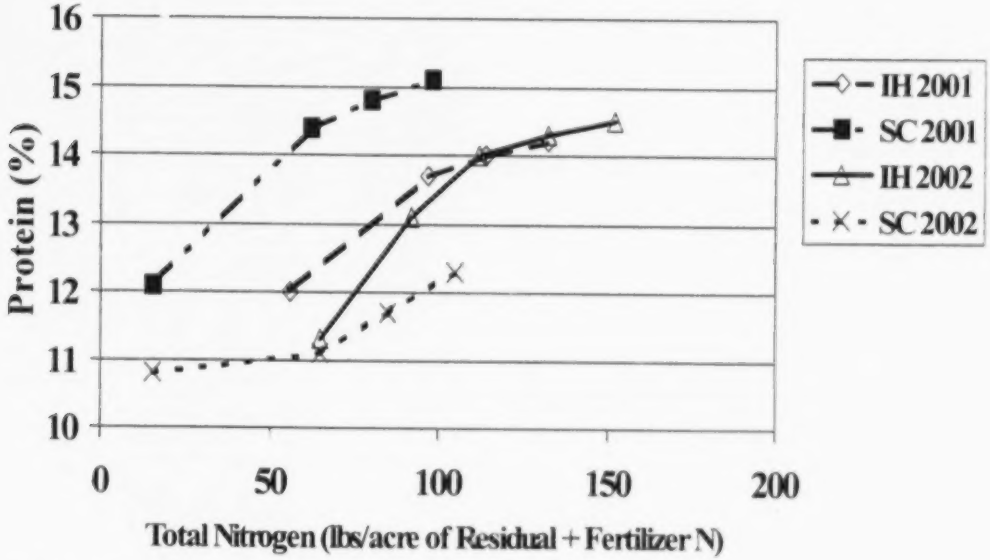


Fig 2. The effect of nitrogen on the protein in durum

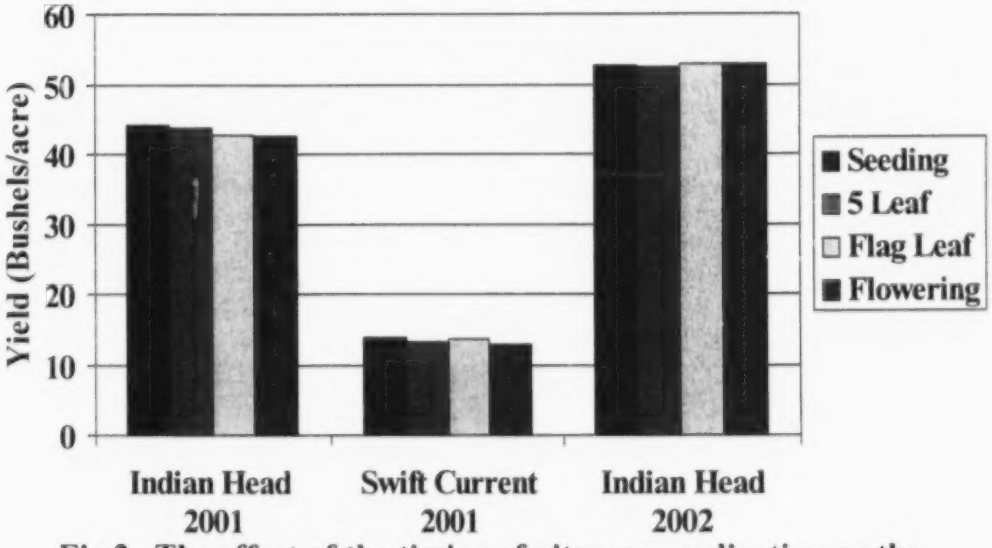


Fig 3. The effect of the timing of nitrogen application on the yield of durum

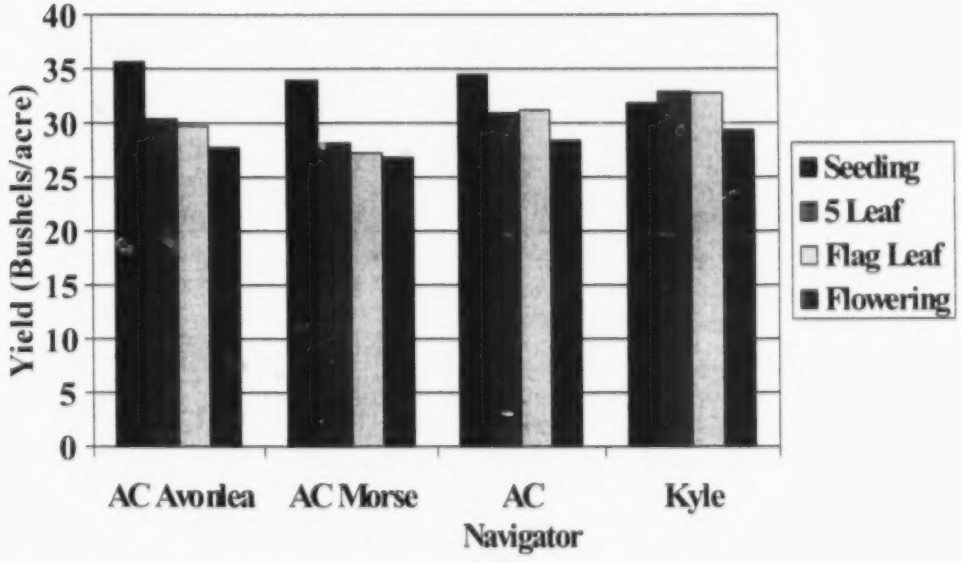


Fig 4. The effect of the timing of nitrogen application on the yield of durum at Swift Current in 2002.

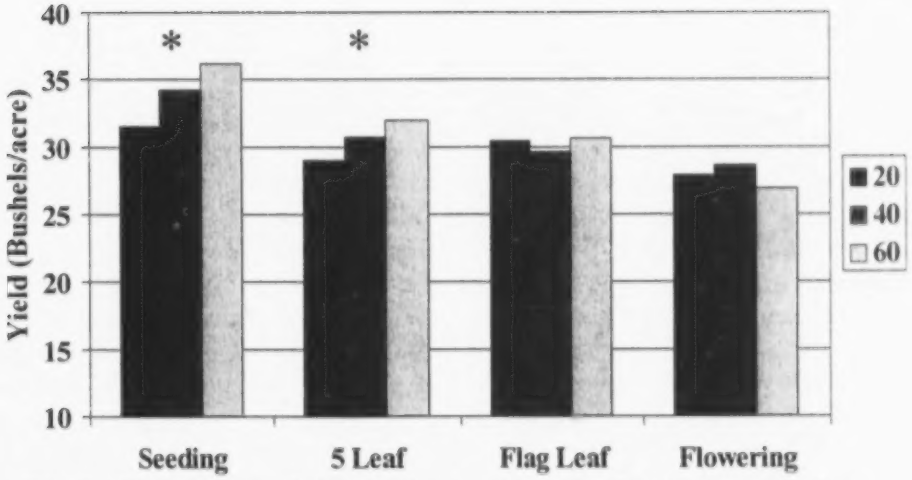


Fig 5. The effect of the timing and rate of nitrogen on the yield of durum at Swift Current in 2002.

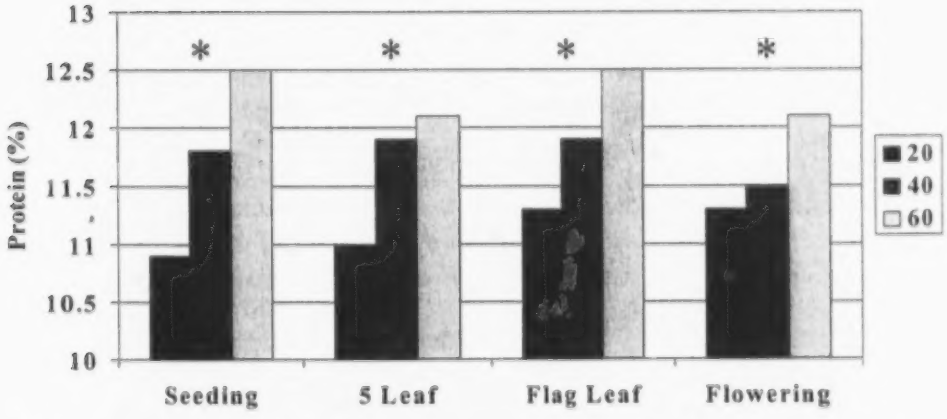


Fig 6. The effect of the timing and rate of nitrogen on protein in durum at Swift Current in 2002.

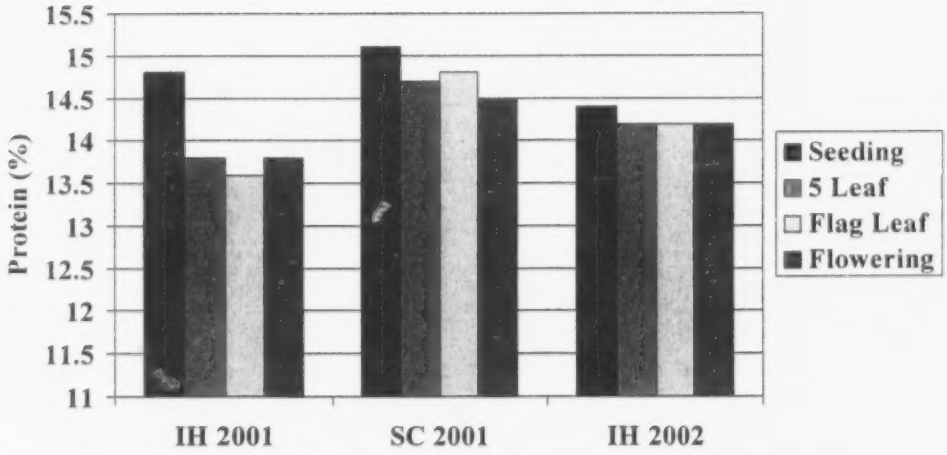


Fig 7. The effect of the timing of nitrogen application on protein in durum

F. Indications for Further Research

It is too early in the study to determine the next direction research should go.

G. Extension Activities

Durum Research, Zero Tillage Field Day 2002, July 23, 2002
Durum Research, Proceedings for the Zero Tillage Field Day 2002, July 2002
Durum Research Update, IHARF Newsletter, Summer 2002
Improving My Farms Durum Quality With Crop Rotation & FertilizationCWB Durum Challenge III, The Changing Marketplace Palliser Pavilion, Kinetic Park Swift Current, Saskatchewan

A. Role of Self Seeding Medics in a Continuous Grain System

B. Summary

Self seeding medics have the potential to reduce crop inputs with out reducing yield. The objective of this study is to examine the performance of medic in a winter wheat-oat-flax rotation. The first year of the study has been initiated.

C. Background and Objectives of Study

Self-seeding cover crops such as medic offer a flexible, low risk, home-grown way to improve farm productivity. In addition to the crop's nitrogen-fixing benefits, the study will investigate medic's potential to stabilize soil salinity, reduce excess water problems, control volunteers and post-harvest weeds, and allow for late-season grazing. Medic and other legumes represent untapped potential for farmers to improve their bottom line. Approximately 10 million acres in the Prairie region can support significant legume plant growth during, and especially after grain crop harvest. And adoption of no-till has increased the late-season soil water supply. Four years of previous research in Manitoba has shown that cover crops in continuous grain systems consistently reduce the need for nitrogen (N) fertilizer by 10 to 65 lbs./acre/year. Assuming an N fertilizer cost of $0.25 to $0.30 a pound, this could mean a value of millions annually for prairie farmers in the black soil zone. Medic is a self-regenerating, low-growing legume that farmers can underseed to wheat and other cereals. The objective of this study is to examine the performance of medic in a winter wheat-oat-flax rotation.

D. Study Description

Split Split plot with medic oats as the main effect and crop as the sub plot and nitrogen rate as the sub-sub plot
Plot Size: 35 feet x 13 ft
Reps: 3
Treatments:

I)Medic	1) No Medic
	2) Medic
II)sub-plot: Crop	1) Winter Wheat
	2) Flax
	3) Oat
IV)subsub-plot:	Nitrogen Rate
	1) 20% of required N
	2) 60%
	3) 100%

E. Results

The medic has been established. The first year of study was initiated this fall when the fall wheat was planted. The flax and oats will be seeded in the spring.

F. Indications for Further Research

It is too early in the study to determine the next direction research should go.

G. Extension Activities

The potential of self seeding medic were discussed at the Zero Tillage Field Day 2002, July 23, 2002

A. Pest Management on the Zero Till Field Day

A. Summary

Pest management in an economic and environmentally sustainable manner is important to producers and the Canadian public. The objective was to inform and educate producers with the newest pest management techniques and how these approaches could fit into their cropping system. The control of pests in durum, winter wheat, oat, flax, pea, lentil, and chickpea. In addition, Garry Bowes gave a presentation on the biological control of Scentless Chamomile.

B. Extension Activities

On the Zero Till Field Day the following people spoke.

a. Bill May: He presented the first year results from an experiment investigating the interaction among agronomic practices like seeding rate and nitrogen rate and fungicides for the control of leaf disease's and fusarium in Durum.

b. Penny Pearse: She discussed the control of fusarium and leaf disease in cereals. Providing a good over view of risk and when to and when not to apply fungicides.

c. Guy Lafond:. He discussed the interaction between agronomic practices like seeding date and seeding depth and weed control in winter wheat.

d. Garry Bowes: He gave a presentation on integrated control program for Scentless Chamomile. The integrated approach includes biological control, herbicide control, pick-bag-burn and plant competition. He reported on the success they had seen using scentless chamomile seed weevil.

e. Sabine Banniza: She talked about root rots, seedling blights, Ascochyta blight, Anthracnose, powdery mildew, Sclerotina white mold and botrytis grey mold in field pea, lentil and chickpea.

f. The following research was briefly mentioned

   i. Controlling wild oat in tame oat using cultural practices

   ii. Fungicides for controlling septoria leaf mottle in canaryseed

   iii. Minor use registration of herbicides in canaryseed

A. Cool season and warm season grasses for swath grazing

B. Summary

Swath grazing has the potential to substantially reduce winter feeding cost of cattle and improve the environment through improved manure distribution. The objective of this study is to investigate the potential benefits of cool season and warm season grasses for forage production to be used in a swath grazing system. The means have been generated but statistical analysis has yet to be done.

C. Background and Objectives of Study

This research project is poised to answer the much-debated issue of the adaptive quality and potential for warm season crops as annual forage in Saskatchewan. Many questions have been raised to SAFRR staff, by producers, over the past period of drought in Saskatchewan, which species serve best for annual forage production, particularly in dry conditions. In some areas, warm season crops tended to outperform cool season crops for forage production (Vanin, unpublished). Studies conducted at the Brandon Research Centre have chronicled warm season crops advantages over cool season in dry matter production, especially for swath grazing (Byron Irvine, pers.comm.). While earlier studies evaluating old generation warm season grasses for greenfeed and silage dissuaded their production in Saskatchewan. The availability of new species and varieties of warm season grasses has reopened this question especially for use in a swath grazing system. If the provincial agricultural community is aiming to increase its cattle herd population, new innovative ideas need to be researched to provide farmers with the best information for feed production. Perennials serve as the cornerpost of the livestock production system, but annuals can provide emergency forage production or used in rotation for diversified grazing.

Objective:

To evaluate forage species for adaptation, quality and yield production in annual forage and swath grazing systems.

D. Study Description

Three Sites: Redvers, Canora, Indian Head

Two seeding dates (two separate blocks): May 15 and June 10 (approximately)

Four randomized replicated trials in each block.

Twelve crops:

1. Fatima Fababean.
2. AC Pinnacle Oats.
3. Ranger Barley.
4. Sandrow Triticale.
5. AC Prairie Gold Proso Millet.
6. Golden German Millet.
7. Strain R German Millet.
8. White Wonder Foxtail Millet.

9. Siberian Red Foxtail Millet.
10. Mil-Hy 300 Pearl Millet.
11. Megagreen Sorghum-Sudangrass.
12. Crown Millet.

Weed Control: preseed burnoff. Glyphosate
In crop weed control: probably just 2,4-D

Fertilizer: 50 lbs N, 20 lbs P (suggested moderate level)

D.Results

The plots have been harvested and means generated. However the statistical analysis has not been completed. The means for all three locations are presented below.

Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding Biomass Yield Kg/ha			
		75	91		
Early	oat	5713	5538		
	barley	6913	5640		
	triticale	5780	5058		
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	6058	8445		
	barley	6573	8735		
	triticale	5033	7248		
	prosso millet	4495	6088		
	crown millet	4828	6855		
	Siberian red millet	4523	7253		
	golden german millet		6173	8310	
	strain R german millet		6083	6973	
	White wonder		6040	7607	
	Pearl Millet		3890	5477	
	sorgum-sudan grass		6618	7555	
	fababeans	3283	4425		
Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding Protein Yield Kg/ha			

		75	91		
Early	oat	606	482		
	barley	581	384		
	triticale	566	344		
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	690	828		
	barley	868	961		
	triticale	513	631		
	prosso millet	499	584		
	crown millet	565	548		
	Siberian red millet	543	645		
	golden german millet		562	640	
	strain R german millet		748	767	
	White wonder		550	631	
	Pearl Millet		482	750	
	sorgum-sudan grass		298	536	
	fababeans	578	558		

Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding TDN Yield Kg/ha			
		75	91		
Early	oat	4123	4231		

	barley	4648	3412		
	triticale	3678	3060		
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	3676	5766		
	barley	4485	5389		
	triticale	2876	4804		
	prosso millet	2908	3855		
	crown millet	2905	4181		
	Siberian red millet	2929	4273		
	golden german millet		3448	5028	
	strain R german millet		3563	4349	
	White wonder		3347	4388	
	Pearl Millet		2422	3947	
	sorgum-sudan grass		3832	4554	
	fababeans	1868	2939		
Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding Protein (%)			
		75	91		
Early	oat	10.6	8.7		
	barley	8.4	6.8		
	triticale	9.8	6.8		

	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	11.4	9.8		
	barley	13.2	11.0		
	triticale	10.2	8.7		
	prosso millet	11.1	9.6		
	crown millet	12.0	8.0		
	Siberian red millet	11.7	8.9		
	golden german millet		9.1	7.7	
	strain R german millet		12.3	11.0	
	White wonder		9.1	8.3	
	Pearl Millet		12.4	13.7	
	sorgum-sudan grass		4.5	7.1	
	fababeans	17.6	12.6		
Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding TDN (%)			
		75	91		
Early	oat	72.2	76.4		
	barley	67.2	60.5		
	triticale	67.6	60.5		
	prosso millet				
	crown millet				

	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	60.7	68.3		
	barley	68.2	61.7		
	triticale	57.2	66.3		
	prosso millet	64.7	63.3		
	crown millet	64.8	62.3		
	Siberian red millet	60.2	58.9		
	golden german millet		55.9	60.5	
	strain R german millet		58.6	62.4	
	White wonder		55.4	57.7	
	Pearl Millet		62.3	72.0	
	sorgum-sudan grass		57.9	60.3	
	fababeans		66.4		

Cool season vs warm season grasses at Indian Head					
Seed date	Variety/species	days after seeding RFV			
		75	91		
Early	oat	124	145		
	barley	112	95		
	triticale	108	95		
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				

	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				
		71	85	98	
Late	oat	114	128		
	barley	107	103		
	triticale	91	103		
	prosso millet	99	106		
	crown millet	103	95		
	Siberian red millet	94	91		
	golden german millet		83	94	
	strain R german millet		91	95	
	White wonder		83	85	
	Pearl Millet		90	97	
	sorgum-sudan grass		86	91	
	fababeans	131	125		

Cool season vs warm season grasses at Redvers					
Seed date	Variety/species	days after seeding Kg/ha			
		75	84	94	109
Early	oat	7305	9085		
	barley	6780	7603		
	triticale	5258	6685		
	prosso millet	4888	5365		
	crown millet	4758	5155		
	Siberian red millet	5058	5833		
	golden german millet		5255	6238	8745
	strain R german millet		4910	5548	7680
	White wonder		4738	5508	7883
	sorgum-sudan grass		3855	5505	7005
	fababeans	2883	3608		
		64	79	98	
Late	oat	7330	7188		
	barley	5748	6663		
	triticale	4928	4788		
	prosso millet	6333	6533		
	crown millet	6458	5793		
	Siberian red millet	5498	6585		
	golden german millet	4890	6060	7620	
	strain R german millet	4505	4775	6970	
	White wonder	5240	6285	9245	
	sorgum-sudan grass	7203	6148	11235	
	fababeans	3720			

Cool season vs warm season grasses at Redvers		
Seed date	Variety/species	days after seeding Protein Yield (Kg/ha)

		75	84	94	109
Early	oat	606	581		
	barley	576	494		
	triticale	526	562		
	prosso millet	464	408		
	crown millet	442	387		
	Siberian red millet	541	542		
	golden german millet		447	474	670
	strain R german millet		476	411	453
	White wonder		483	430	504
	sorgum-sudan grass		347	396	406
	fababeans	496	657		
		64	79	98	
Late	oat	601	489		
	barley	489	433		
	triticale	527	393		
	prosso millet	519	464		
	crown millet	659	417		
	Siberian red millet	588	474		
	golden german millet	514	497	428	
	strain R german millet	545	549	641	
	White wonder	576	559	666	
	sorgum-sudan grass	627	443	652	
	fababeans	487			

Cool season vs warm season grasses at Redvers

Seed date	Variety/species	days after seeding TDN Yield (Kg/ha)			
		75	84	94	109
Early	oat	4830	5983		

	barley	4682	4955		
	triticale	3446	4442		
	prosso millet	2846	2978		
	crown millet	3000	3329		
	Siberian red millet	1814	3318		
	golden german millet		3027	3473	4756
	strain R german millet		2770	3307	4097
	White wonder		2687	3004	4166
	sorgum-sudan grass		2360	3408	3889
	fababeans	1807	1933		
		64	79	98	
Late	oat	4018	4375		
	barley	3599	3696		
	triticale	3157	3059		
	prosso millet	3786	3616		
	crown millet	4250	3577		
	Siberian red millet	3196	3933		
	golden german millet	2855	3336	4155	
	strain R german millet	2753	2808	4120	
	White wonder	2930	3587	5430	
	sorgum-sudan grass	3913	3670	6812	
	fababeans	1792			

Cool season vs warm season grasses at Redvers					
Seed date	Variety/species	days after seeding Protein (%)			
		75	84	94	109
Early	oat	8.3	6.4		
	barley	8.5	6.5		
	triticale	10.0	8.4		

	prosso millet	9.5	7.6		
	crown millet	9.3	7.5		
	Siberian red millet	10.7	9.3		
	golden german millet		8.5	7.6	8.0
	strain R german millet		9.7	7.4	5.9
	White wonder		10.2	7.8	6.4
	sorgum-sudan grass		9.0	7.2	5.8
	fababeans	17.2	18.2		
		64	79	98	
Late	oat	8.2	6.8		
	barley	8.5	6.5		
	triticale	10.7	8.2		
	prosso millet	8.2	7.1		
	crown millet	10.2	7.2		
	Siberian red millet	10.7	7.2		
	golden german millet	10.5	8.2	5.9	
	strain R german millet	12.1	11.5	9.2	
	White wonder	11.0	8.9	7.2	
	sorgum-sudan grass	8.7	7.2	5.8	
	fababeans	14.9			
Cool season vs warm season grasses at Redvers					
Seed date	Variety/species	days after seeding TDN			
		75	84	94	109
Early	oat	66.1	65.9		
	barley	69.1	65.2		
	triticale	65.6	66.5		
	prosso millet	58.2	55.5		
	crown millet	63.1	64.6		

	Siberian red millet	55.7	56.9		
	golden german millet		57.6	55.7	54.4
	strain R german millet		56.4	59.6	53.3
	White wonder		56.7	54.5	52.9
	sorgum-sudan grass		61.2	61.9	55.5
	fababeans	62.7	53.6		
		64	79	98	
Late	oat	54.8	60.9		
	barley	62.6	55.4		
	triticale	64.1	63.9		
	prosso millet	59.8	55.4		
	crown millet	60.6	61.8		
	Siberian red millet	58.1	59.7		
	golden german millet	58.4	55.0	57.2	
	strain R german millet	61.1	58.8	59.1	
	White wonder	55.9	57.1	58.7	
	sorgum-sudan grass	59.0	59.7	60.6	
	fababeans	54.8			
Cool season vs warm season grasses at Redvers					
Seed date	Variety/species	days after seeding Relative Feed Value			
		75	84	94	109
Early	oat	108	113		
	barley	117	97		
	triticale	94	100		
	prosso millet	90	119		
	crown millet	96	100		
	Siberian red millet	89	81		
	golden german millet		91	87	89

	strain R german millet		88	88	86
	White wonder		84	85	78
	sorgum-sudan grass		94	96	83
	fababeans	155	109		
		64	79	98	
Late	oat	84	100		
	barley	95	86		
	triticale	86	90		
	prosso millet	92	90		
	crown millet	90	95		
	Siberian red millet	86	94		
	golden german millet	88	86	92	
	strain R german millet	92	92	90	
	White wonder	84	87	87	
	sorgum-sudan grass	89	89	93	
	fababeans	116			

Cool season vs warm season grasses at Redvers					
Seed date	Variety/species	days after seeding			
		75	84	94	109
Early	oat				
	barley				
	triticale				
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				

	fababeans				
		64	79	98	
Late	oat				
	barley				
	triticale				
	prosso millet				
	crown millet				
	Siberian red millet				
	golden german millet				
	strain R german millet				
	White wonder				
	sorgum-sudan grass				
	fababeans				

Cool season vs warm season grasses at Canora

Seed date	Variety/species	Stage	Yield (kg/ha)	Protein Yield	TDN Yield
Early	oat	milk dough	5565	595	3574
	barley	soft dough	5265	711	3385
	triticale	milk-soft dough	4692	464	2886
	prosso millet	2 wks after Head	4975	801	2925
	crown millet	2 wks after Head	5258	931	3076
	golden german millet	1-2 wks after Head	11085	1330	5997
	strain R german millet	1-0 wks before head	8925	1321	5087
	White wonder	1-2 wks after Head	10418	1208	5250
	mil hy pearl millet	not headed	7305	1337	4332
	sorgum-sudan grass	not headed	12778	1853	7743
	fababeans	full pod	6725	888	3934
Late	oat	milk dough	6065	618	3500
	barley	soft dough	7795	1029	5098

	triticale	milk-soft dough	5238	518	3221
	prosso millet	2 wks after Head	6225	934	3685
	crown millet	2 wks after Head	6218	1013	3631
	Siberian red millet	1-2 wks after Head	6345	894	3471
	golden german millet	1-2 wks after Head	7808	937	4185
	strain R german millet	1-0 wks before head	7218	1111	4374
	White wonder	1-2 wks after Head	8285	1101	4673
	mil hy pearl millet	not headed	7838	1293	4687
	sorgum-sudan grass	not headed	13165	1698	7557
	fababeans	full pod	5953	935	3780
LSD			1489	210	872
CV			14	15	14

E. Indications for Further Research

An application to ADF has been submitted to carry on this research

F. Extension Activities

The potential of warm season grasses were discussed at the Zero Tillage Field Day 2002, July 23, 2002

North East Agricultural Research Foundation
Melfort

NARF Leaders – Randy Kutcher, Gord Pearse, Tom Boyle

The Northeast Agricultural Research Foundation (NARF) was formed in 1996 as a farmer-managed and directed vehicle to conduct local agricultural research and demonstration. NARF has producer representation from across Northeast Saskatchewan and works closely with AAFC - Melfort Research Farm, SAFRR Extension staff, and the agri-business community.

In the past, Spoke projects have been located at the Melfort Research Farm. There is also a Precision Farming site located at S1/2 29-44-18 RM Star City. Melfort Research Farm contributes land and access to equipment, technical support, and an administration office. Site activities are also supported by PFRA and SAFRR staff.

2002 NARF On-Farm Research

Project 2002Walker1: Effect of seed treatment on insect control and canola yield
Cooperator, Location: Vince Walker, Brooksby

Objective:
Lindane, the active ingredient used to control flea beetles in canola has been de-registered and will no longer be available after 2002. This has meant that the industry must develop alternative options, and in the spring of 2002, there were only two options. Helix (containing thiamethoxam as the insecticide, plus the fungicides of difenoconazole, metalaxyl-M, and fludioxonil) and Foundation Lite (containing two fungicides of iprodione and thiram with no insecticide) will be compared in efficacy against the flea beetle, and also subsequent yield loss due to that damage. It has been agreed that Helix is a very good product for flea beetle control and protection against other fungal pathogens, and environmentally safe, but is substantially more costly than the lindane products of the past. Foundation Lite offers a cost-effective option in years when flea beetle pressure should be minimal.

Methods:
The canola variety 2663 (Liberty Link hybrid) was seeded, with the Helix and Foundation Lite applied commercially. The canola was seeded into cereal stubble, under typical canola crop rotation for the region. The treatments were replicated as described below, at the south end of the 240 acre field, 200 feet by 2640 feet long, for about 11.5 acres for each treatment. The plots were initially defined by stakes, and then geo-referenced by Gord in late June.

2663 with Foundation Lite	2663 with Helix	2663 with Foundation Lite	2663 with Helix

Results:
Data collection:
Seeding date and conditions – May 14, into dry soil conditions
Incidence of flea beetle damage (visual estimations) – Flea beetle pressure in northeast Saskatchewan was variable, but this field had significant damage. The Foundation Lite plots were sprayed with Decis EC at 0.04 L/ac to avoid complete seedling loss.
Harvest date – September 19 – 23, 2002
Seed yield – 12.8 bu/ac (entire field)
Any other relevant agronomic or climatic data – This field did not escape the severe drought conditions experienced in much of Saskatchewan in 2002. Differences in yield between treatments are expected to be much better under even average growing conditions.

Yield and economic evaluation:
See attached yield maps generated by Vince (JD Greenstar), and Gord (SSToolbox). It should also be noted that portions of the remainder of this field were seeded with one or the other seed treatments. The yield map would indicate differences in yield, but are not quantified.

This analysis is to include only the seed treatments and inputs in relation to crop yield.

	Cost ($/acre)	
	Helix	**Foundation Lite**
Canola yield (bu/ac) (Average of two reps)	11.6	10.8
Seed cost ($/ac) Including seed, seeded @ 5.5 lbs/ac	24.75	24.75
Applied treatment @ 5.5	6.87	1.93
Insecticide ($/ac)	0.00	3.46
Application ($/ac)	0.00	3.50
Total	**31.62**	**33.64**

Conclusion: By using Helix as a measure of flea beetle control instead of Foundation Lite, the producer improved his gross income $9.20/ac, by assuming $9.00 / bushel canola, an increase in yield of 7 %, and a $2.00/ac savings on input costs. Therefore without the ability to predict flea beetle pressure, yield will improve and input cost per acre will be less using the more expensive seed treatment, based on one field's results.

Project 2002Walker2: Clearfield Canola Variety Trial
Cooperator, Location: Vince Walker, Brooksby

Objective:
Clearfield canola production systems are widely used in all production regions of Saskatchewan, and the system is used by several plant breeding institutions. The objective of the trial is to evaluate the yield potential under local growing conditions.

Methods:
The plot was seeded in a non-replicated strip trial, on about 100 of the 310 acre field. Plot size ranged from 15 to 30 acres. Stakes initially defined the plot regions, and were later geo-referenced by Gord in July.

Results:
Seeding date and conditions – May 12, 2002
Harvest date – September 26 to October 7, 2002
Seed yield – entire field yield was 22.4 bu/ac.
Any other relevant agronomic or climatic data – An isolated but intense thunderstorm passed through this region in early June, and growing conditions were much more conducive to average canola yields than in other parts of the province, despite some damage to low lying regions of the fields. However, in July the same area was affected by a hailstorm, and did cause some significant damage. As indicated by the yield map, yields were less in the southern portion of the ½ section, and the plots were located in the best portion of the field.

Conclusion:
Considering that the trial was unreplicated, plot size was not uniform, and there was considerable variability in the field with respect to soil type and hail damage, results should be shared with due caution. See attached Greenstar yield map and SSToolbox yield map with geo-referenced locations. Yield results are as follows:

Variety	Yield (bu/ac) *
1604 (#1)	29.7
1670-1-9375	30.8
289	28.3
1604 (#2)	27.9
45A77	25.3
46A73	24.0

* sd 1.75

Project 2002Walker3: Effect of foliar fungicides on pea yield
Cooperator, Location: Vince Walker, Brooksby

Objective:
A new fungicide will be available to Saskatchewan pulse producers by 2003. Headline (active ingredient - pyraclostrobin) controls ascochyta / mycosphaerella blight and powdery mildew in field peas, both of which can cause significant yield reductions and harvestability issues in certain years.

Methods:
The applications and subsequent plot evaluations were not completed this year, due to severe drought conditions. The treatments were not applied due to complete absence of disease, and uneconomical pea yields.

Project 2002Gates1: Effect of phosphate inoculant on pea yield
Cooperator, Location: Terry Gates, Nipawin

Objective:
The phosphate mineralizing soil bacteria within Jumpstart has been responsible for increased grain yield of a variety of crops, particularly field peas. Under good fertility management systems, annual application of phosphate fertilizer has inadvertently increased the amount of unavailable soil phosphate, and therefore this soil inoculant will help to make it available to the plant. The objective of this trial is to quantify results of using Jumpstart instead of seed placed granular phosphate fertilizer.

Methods:
Field, variety selection, and treatment plan: The intent of the project was to be as follows: Choose a field in typical crop rotation for peas production. The yellow peas variety Delta will be sown at uniform fertility rates and seeding management. Avoid obvious or known field variability with respect to soil fertility, or at least orient the replicates in a manner that accounts for this. Harvest yield area should not include the headlands due to the border effect. Stakes or posts will initially define treatment area, then geo-referenced by Gord at a later date. It is recommended to replicate the trial within the field. Treatments and checks should be at least four seeding passes wide. Jumpstart should be applied according to label recommendations.

Jumpstart, no seed placed phosphate	Check, no seed placed phosphate	Jumpstart, no seed placed phosphate	Check, no seed placed phosphate

Results:
Data collection:
Seeding date and conditions – May 5
Seed yield – 11 bu/ac
Any other relevant agronomic or climatic data – Total precipitation was 5.3 inches from April 1 to Aug 31.

When crops yield as poorly as they have in 2002, yield monitors and mapping processes do not work as well as when there is a consistent flow of at least an average crop. Much of this field had no yield at all, and Terry thought that there would be little value in any data obtained through the map. The field was geo-referenced in June, but even at that date, the yield potential of the pea crop was drastically reduced.

Conclusions:
Brief economic analysis:
There was no seed placed phosphate in the check, and therefore the cost of Jumpstart is a direct cost, rather than a replacement cost for granular phosphate fertilizer. Depending on sowing rate (seed size), Jumpstart costs $5 to $8.50 per acre for field peas, so roughly a yield increase of 1 to 1.5 bu/ac would justify the cost of the product. Terry does not think that there was a visible yield improvement in the field, and certainly not enough to

make a difference on the monitor. However, with the terrible growing conditions for peas this summer, it is unlikely that there would have been a benefit to any traditional sources of phosphate either.

Project 2002Gates2: Effect of foliar fungicides on wheat yield
Cooperator, Location: Terry Gates, Nipawin

Objective:
As demonstrated in previous NARF projects, leaf diseases can severely affect grain yield and quality under the right growing conditions. Canadian plant breeders have introduced new varieties that have at least partial resistance to some of them, but NARF, nor any in the northeast, have difficulty in predicting potential yield losses due to leaf diseases. More data from more producers will assist in determining when and where foliar fungicides are warranted.

Methods:
Field, variety selection, and treatment plan: The following is the plot plan that was suggested: Choose a field in typical crop rotation for wheat production. The variety AC Elsa will be sown at uniform fertility rates and seeding management. Avoid obvious or known field variability with respect to disease incidence, or at least orient the replicates in a manner that accounts for this. Harvest yield area should not include the headlands due to the border effect. Stakes or posts will initially define treatment area, then geo-referenced by Gord at a later date. It is recommended to replicate the trial within the field, and also with additional fields. Treatments and checks should be at least four spray passes wide. Tilt should be applied according to label recommendations with respect to timing, rates, and water volumes.

Tilt	Check	Tilt	Check

Results:
Data collection:
Seeding date and conditions – May 20, dry soil conditions
Grain yield – 22 bu/ac
Precipitation by month, inches: April 1.0 inches, May nil, June 1.5, July 0.4, Aug 2.4, for a total of 5.3 inches.

Conclusions:
It became increasingly evident by late June that yield potential of all crops in much of northeast Saskatchewan had been drastically reduced, due to excessive heat and lack of moisture. There was little point in proceeding with the project, as past experience has taught us that dry soil and leaf conditions are not conducive to foliar leaf disease development. Therefore much of the above listed responsibilities were not required nor completed.

Brief economic analysis:
Full retail price of Tilt 250E is $13.50/ac, plus $3.50/ac application cost. Break even yield increase for application would be 3.1 bu/ac, assuming $5.50 / bu and no opportunity or finance costs.

Project 2002Christopherson1: Evaluation of perennial cereal rye vs. barley for silage
Cooperator, Location: Lorne Christopherson, Weldon

Objective:
A new crop kind has been developed at the Lethbridge Research Center – perennial cereal rye. It is similar to fall rye (*Secale cereale*) in its growth characteristics, except that the plant persists after its first seed set. For producers who silage annual crops on a regular basis, this could be an important crop. The object of the trial is to determine if it can yield like an annual crop, yet persist like a perennial, without the annual input costs.

Methods:
Field, variety selection and treatment plan: The following suggestions were recommended for implementation in 2002: Choose field at least 80 acres in size, and appropriate for silage for 2003, 2004, and possibly 2005, but ready to seed Sept 15, 2002. Pcr seed is to arrive in September, and sown as soon as possible. A silage barley variety should be sown for comparison purposes. Avoid obvious or known field variability, or at least orient the replicates in a manner that accounts for this. Harvest yield area should not include the headlands due to the border effect. It should be replicated within the field, but harvested at the same date. Forage weights will be determined by Christopherson's scale, with samples taken on ½ of the loads, and a 5 kg sample bulked and retained for each of the following replicates. The intended duration and plan of the project is to harvest pcr vs barley for 2003 and 2004, with a spring evaluation and plow out in spring of 2005, and cropped accordingly by the cooperator thereafter. Should the pcr fail to survive past the 2003 harvest, this will be a one year trial. Should the pcr persist and perform exceptionally past the 2004 harvest, this could be extended for a longer period of time.

Perennial cereal rye	Silage barley	Perennial cereal rye	Silage barley

Data collection (all years):
Seeding dates and conditions –
Harvest date, methods –
Forage quality (CP, ADF, NDF, TDN) –
Any other relevant agronomic or climatic data –

Results:
This trial was not initiated in September, 2002, not just due to the abhorrent weather conditions in northeast Saskatchewan, but because of the lack of seed stock. The perennial cereal rye variety is in the Foundation seed production stage in southern Alberta. Gord had contacted the seed grower, upon the advice of the plant breeder, and had discussed purchasing a tote bag (approx 750 kg) of seed. This was initially done in June, but Gord continued to call in August, to confirm seed availability. By mid September, it became evident that this seed was not going to arrive, so it was agreed that the trial would be suspended for a year. Harvest everywhere in western Canada was a

struggle in 2002, but this is rye, and should have been harvested in ample time for processing and seeding. It was also assumed that because this is a unique variety and crop kind, the field would have been treated as a priority, which may indicate that there may be other issues with the crop.

Conclusions:

There is significant interest in evaluation of annual forages for yield potential and economics, and therefore it is recommended that NARF and Lorne Christopherson initiate and seed the same project next year, weather and seed source permitting.

Project 2002Beauchesne: Effect of Potassium fertilizer rate and application method on canola yield
Cooperator, Location: Ed & Marguerite Beauchesne, Albertville

Objective:
Higher than recommended rates of potassium (K) have been applied to Beauchesne's canola fields, with dramatic yield increases noted in the past. It has been suggested that this is at least partially due to improving seedling vigour and plant health on K deficient soils. This project will evaluate different rates of K fertilizer, seed places and broadcast after seeding.

Methods:
2002
Field selection and treatment plan: Recommendations for implementation of the project were as follows: Seed canola into cereal stubble, under typical canola crop rotation for the region. Avoid obvious or known field variability with respect to soil fertility. Beauchesnes fertilized the entire field with a actual regime of 95N-25P-25S, with 13K on all but one pass through the middle of the field, which received no potassium at all. Stakes initially defined the treatment area, and the three treatments were later geo-referenced by Gord.

There were no differences in application method applied in 2002.

Plans for 2003
Sow barley or wheat, with constant seed applied rate of 35 lbs actual K/ac, with no pre-seed broadcast application of K. The plots will be harvested in the same manner as in the past year. Data collection should include seeding date, effect of yield on plots (already geo-referenced), and any other relevant agronomic or climatic data.

Results:
Data collection:
Seeding date – May 13, 2002 –
Soil moisture conditions – extremely dry, with 2 ¼ inches from April 1 to July 31, 3 ½ from August 1 to September 30.
Harvest date – finished November 10, 2002
Presence of disease – this was to be done by Gord, but no disease noted through entire year, just severe drought conditions, followed by poor harvest conditions.

Yield data:

See attached yield map regarding the differences in treatment. Using a standard deviation of 2.00, which did not include 2.1 % of the yield points, the average yield of the field was 15.5 bu/ac. Without any potassium, the field yielded 8.5 bushels per acre. The north, fertilized piece yielded 20.2 bu/ac, and the south fertilized piece yielded 13.4 bu/ac.

Conclusion:

This is just one year's data, with abnormal growing conditions, but Beauchesnes' hypothesis that K fertility increases yield on canola proved true, although this may be a fertility effect, and not a disease effect. The growing conditions in 2002 were not conducive to the development of foliar, stem, or root pathogens, so the tremendous yield advantage with K applied fertilizer was likely due to the unavailability of soil potassium.

Hypothesis for 2003

It is anticipated that there will be little residual effect of seed applied K in 2002 on the following cereal crop in 2003, but the field will be mapped for yield regardless.

Project 2002Beauchesne2: Effect of fertilizer application method on timothy yield
Cooperator, Location: Ed & Marguerite Beauchesne, Albertville

Objective:
Timothy hay production for the double compressed hay export market, and often timothy seed production, can be very lucrative to Saskatchewan producers if fields are managed appropriately. Timothy responds well to, and requires high levels of fertility, so the intent of the project is to evaluate different timing and methods of application of the same rate of nutrients.

Methods:
Field selection and treatment plan: The following was the recommended practices for the fertility trial. What actually occurred was very little, since extreme drought eliminated any yield potential on timothy. There was a 120-acre field of timothy, within which there will be the following treatments.

Oct 2001 - liquid fertilizer injection with coulter 85N-25P-0K-5S, actual April 2002 – broadcast granular KCl at 125K actual (208 lbs product)	April 2002 – dribble (surface) liquid application 85N-25P-0K-5S, actual April 2002 – broadcast granular KCl at 125K actual (208 lbs product)	April 2002 - liquid fertilizer injection with coulter 85N-25P-0K-5S, actual April 2002 – broadcast granular KCl at 125K actual (208 lbs product)

Results and Conclusion:
On a year like 2002, timothy did well to survive. There was no data taken from this field, at any time.

Project 2002Moskal1: Effect of foliar fungicides on barley yield
Cooperator, Location: Al & Stacey Moskal, Brooksby

Objective:
As demonstrated in previous NARF projects, leaf diseases can severely affect grain yield and quality under the right growing conditions. Canadian plant breeders have introduced new varieties that have at least partial resistance to some of them, but NARF, nor any in the northeast, have any concrete yield numbers on what is now the premier two-row malt barley variety – AC Metcalfe.

Methods:
Field, variety selection, and treatment plan: The following recommendations were made in the spring for project implementation: Choose a field in typical crop rotation for malt barley production. AC Metcalfe will be sown at uniform fertility rates and seeding management. Avoid obvious or known field variability with respect to disease incidence, or at least orient the replicates in a manner that accounts for this. Harvest yield area should not include the headlands due to the border effect. Stakes or posts will initially define treatment area, then geo-referenced by Gord at a later date. It is recommended to replicate the trial within the field, and also with additional fields. Treatments and checks should be at least four spray passes wide. Tilt should be applied according to label recommendations with respect to timing, rates, and water volumes.

Tilt	Check	Tilt	Check

Results:
Seeding data, moisture, and presence of disease were to be taken at the appropriate time, but it became increasingly evident by late June that yield potential of all crops in much of northeast Saskatchewan had been drastically reduced, due to excessive heat and lack of moisture. There was little point in proceeding with the project, as past experience has taught us that dry soil and leaf conditions are not conducive to foliar leaf disease development. Therefore the prudent approach to this project was to do away with it.

Effect of Fungicide and Cultivar on Wheat Leaf Spot Diseases and Yield at Melfort, 2002

H.R. Kutcher and B. Sullivan

AAFC, Melfort

OBJECTIVE: to determine the impact of Tilt (propiconazole) and Headline (pyraclostrobin) fungicides on leaf spot diseases, yield and quality of various wheat cultivars.

FUNGICIDES: Tilt - propiconazole
Headline - pyraclostrobin

CULTIVARS: AC Barrie, AC Superb, CDC Intrepid, Prodigy, CDC Crystal

MATERIALS & METHODS: The experiment was a split-plot design with 6 replicates. Cultivars were main plots and fungicide treatments the sub-plots (4.8 X 10 M).

A preseeding burn-off was conducted with 1.25 L/ha Round-up (glyphosate). The experiment was seeded on summerfallow at the Melfort Research Farm May 21st using a John Deere Hoe Drill. Forty-five kg/ha of 11-51-0 fertilizer was seed placed. Plots were blanket fertilized with 34-0-0 at 84 kg actual N/ha on June 4th. Pardner (bromoxynil) was applied on June 24th for broadleaf weed control. There were few grassy weeds present.

Fungicides were applied at the flag leaf stage, Tilt – July 3rd and Headline – July 4th. Diseases were assessed at the soft dough stage of growth on 25 plants per plot (August 1st). Flag and Flag-1 (penultimate) leaves were assessed on a 0-11 point scale based on the % of tissue infected. Plants were also assigned a rating between 0 –11 based on assessment of disease symptoms on foliage of the whole plant.

Plots were harvested by straight combining on Sept 12th. The harvested area of each plot was 1.25 X10 M.

RESULTS: See Table 1. Experimental conditions were poor due to the drought.

CONCLUSIONS: Disease symptoms in this experiment were light relative to previous years. However, the Headline treated plots appeared to reduce leaf spot symptoms compared to the check for most cultivars, while differences between Tilt treatments and the check were not as apparent. Due to the severe drought, followed by damp cool harvest conditions, foliar diseases appeared to have had little impact on yield and quality of any of the cultivars.

Table 1. Effect of fungicide treatment and variety on wheat foliar disease symptoms, yield, bushel weight (BW), thousand kernel weight (TKW) and % plumb kernel (>6/64") at Melfort, 2002.

Cultivar / Fungicide Treatment	Flag (0-11)	Flag-1 (0-11)	Whole Plant (0-11)	Yield (kg/ha)	BW (kg/hl)	TKW (grams)	%Plump Kernels
AC Barrie							
	0.4 a	0.6 b-e	0.8 b-e	1997 ab	75.5 a	35.4 d	94.4 bcd
Check							
Tilt	0.1 cd	0.4 d-h	0.5 c-f	1812 b	75.7 a	34.8 de	93.4 cd
Headline	0.1 cd	0.3 e-h	0.4 ef	1843 b	75.5 a	35.2 d	93.7 cd
AC Superb							
Check	0.3 abc	0.8 ab	1.0 bcd	1788 b	74.2 b	37.2 c	94.4 bcd
Tilt	0.1 cd	0.4 c-g	0.5 c-f	1852 b	74.5 b	39.1 ab	94.8 abc
Headline	0 d	0.1 h	0.1 f	1815 b	74.1 b	37.7 bc	94.0 cd
CDC Intrepid							
Check	0.2 bc	0.6 b-e	0.9 b-e	1825 b	74.1 b	33.4 efg	90.8 e
Tilt	0.2 bc	0.5 b-f	0.4 def	1848 b	73.6 b	33.4 efg	90.2 e
Headline	0 d	0.1 gh	0.1 f	2015 ab	73.9 b	33.9 def	92.6 d
Prodigy							
Check	0.4 a	1.0 a	1.4 ab	1938 ab	74.4 b	31.9 g	93.9 cd
Tilt	0.3 abc	0.7 bcd	0.9 b-e	2104 a	74.1 b	32.7 fg	94.9 abc
Headline	0 d	0.1 h	0.2 f	2004 ab	74.4 b	32.9 fg	94.0 cd
CDC Crystal							
Check	0.4 a	0.7 abc	1.7 a	1245 d	70.3 c	39.3 ab	96.5 a
Tilt	0.3 ab	0.6 b-e	1.0 bc	1392 cd	69.9 c	39.5 a	95.3 abc
Headline	0.2 bcd	0.3 fgh	0.3 f	1475 c	70.7 c	40.2 a	96.2 ab
$LSD_{(0.05)}$	-	-	-	219	0.86	1.52	1.65

Yield and Quality of Yellowfeed and Greenfeed Oats and Barley Harvested at Melfort

Allan Foster, Saskatchewan Agriculture, Food and Rural Revitalization, Tisdale
Linden McFarlane, Agriculture and Agri-food Canada, Melfort

Background

Currently annual cereal crops to be baled are cut, crimped, and windrowed in the soft dough stage. The windrow lies in the field until the material is dry for baling. During this interval, rain may occur which lengthens the drying process. Also, the windrow is difficult to dry and may require turning before it can be baled.

A new technique is to spray the crop in the soft dough stage with glyphosate. The crop is allowed to stand until it is dry, then cut and baled. This method decreases harvest risk and allows the producer to schedule harvest, similar to chopping silage.
Added benefits are excellent perennial weed control and reduced cutting cost because the feed can be cut with a swather instead of a crimper. If the crop can be dried standing with minimal losses, this method would be an alternative to silage with significant cost savings to producers.

The objective of this project was to determine the effect glyphosate had on the yield and quality of oat and barley greenfeed.

Method

In 2001, replicated plots of each of oat and barley were seeded at the Melfort Research Farm. Half of each plot was sprayed with 1 litre of glyphosate when the crop reached the milk stage of development. Both the sprayed and unsprayed crops were swathed and baled. The unsprayed crops were swathed July 27 and baled Aug 8. The sprayed crops were swathed and baled Aug 10. The bales were weighed to determine the total harvested forage from each of the sprayed and unsprayed treatments for each crop. Feed samples from the baled crop were taken immediately after baling and sent for protein and energy analysis.

In 2002 replicated plots of oat and barley were seeded on May 24. Half of each plot was sprayed with Roundup at 1 litre per acre 4 days before the soft dough stage. Spraying occur slightly earlier than the soft dough stage because it was observed in 2001 that the crop took 4-5 days of good warm weather to start to dry down. During this time it continues to mature. The other half of the plot was swathed at the late milk stage. Yield and quality at swathing was measured for both treatments. Because the green feed lay in the swath for a number of days while drying the quality of the green feed was measured

again at baling. The crop was sprayed on July 13. The unsprayed plots were baled on July 30.

Results

Yield results are given in Table 1 and 2.

Table 1 : Dry matter yield, % protein and % total digestible nutrients (TDN) of barley and oat green and yellowfeed harvested at Melfort in 2001.

Crop	*Treatment*	*Dry Matter (kg/ha)*	*% Protein*	*% TDN*
Oat	*Unsprayed*	*2860*	*15*	*61.3*
Oat	*Sprayed*	*2690*	*10.5*	*61.7*
Barley	*Unsprayed*	*3558*	*16.9*	*61.8*
Barley	*Sprayed*	*2744*	*13.2*	*63.2*

Table 2: Yield, %protein and % total Digestible nutrients (TDN) of barley and oat green and yellowfeed harvested at Melfort in 2002.

Crop	Treatment	Dry Matter (kg/ha)	% Protein	% TDN
Oat	Unsprayed	3925	12.6	65.2
Oat	Sprayed	2941	10.6	63.1
Barley	Unsprayed	3489	12.4	72.1
Barley	Sprayed	2825	13.4	69.0

In 2001, dry matter yields of oat green feed and yellow feed were not significantly different. There was a reduction in the barley yield for the sprayed treatment however this difference was not determined to be statistically significant because of the variability within the plots. This variability was caused by uneven germination due to dry conditions and Roundup drift from an adjacent project that affected this project reducing the number of usable replicated plots. Unfortunately the results from this project must be used with caution. In this experiment application of Roundup on green feed did not affect the yield for either the oats or the barley. This is consistent with similar results obtained in greenfeed and yellowfeed projects in Southeast Saskatchewan in 2001.

In this demonstration we collected only one sample from each of the treatments for feed quality analysis. The total digestible energy content of both crops was not affected by the application of glyphosate.

This may not have been the case for protein levels. The yellowfeed oat treatment was 5% lower in protein than the greenfeed treatment and the barley yellow feed was 3.7 % lower in protein than the barley greenfeed. This is unusual because results from an on-farm sample in 2001 had that the protein content was not significantly affected by the use of preharvest glyphosate on greenfeed.

With only one sample taken this difference in protein content may be a result of sampling. However it is probable that the reduction in protein is a result of cutting date. In this project the greenfeed was cut the day the yellowfeed was sprayed, as a result some additional maturation of the standing yellowfeed crop would have taken place while the yellowfeed was drying down. This would account for the reduction in protein levels. A slight reduction in quality, especially protein content, should be expected from the spraying date to the cutting date because plant senescence is not immediate.

In 2002 there was significant difference in yield but not quality between the sprayed and unsprayed crop. In this trial, spraying glyphosate on oat and barley greenfeed crops to aid in dry down, resulted in loss of oat greenfeed production. This reduction in dry matter yield was greater in 2002 than that observed in 2001. Protein and TDN were only slightly lower in the sprayed than the unsprayed treatments for both crops. In this project the protein levels of both sprayed and unsprayed greenfeed were quite acceptable. Producers wishing to harvest yellowfeed of a quality found for greenfeed in this project are advised to spray at a slightly earlier stage of plant development

In both years this project was completed in August when drying conditions were relatively good. Glyphosate applications in late September and early October of 2002 often did not result in adequate dry down of the crop. This was probably a result of the higher humidity experienced that fall, resulting in only a few good drying days.

A. Cover Crop Seeding Rate Trial

Allan Foster Saskatchewan Agriculture, Food and Rural Revitalization, Tisdale
Randy Pastl, Saskatchewan Forage Council, Saskatoon

B. Background

In northeast Saskatchewan the majority of forage crops are still seeded with a cover crop. Quite often this is done to provide some return in the year of forage establishment. But it is also done to protect fragile soils from wind erosion and also to help prevent chaffy forage seed from bridging in the seed box or tank. The main concern with cover crops has always been the competition they provide to the establishing forage plants. As a result the use of cover crop is not recommended or if used it is recommended to seed the cover crop at less than ½ the normal seeding rate. However producers tend to feel that greenfeed production would suffer if the seeding rate is drastically reduced. As a result they tend to seed the cover crop heavier than recommended in order to ensure an adequate greenfeed crop for harvesting. This project is examining the relationship between seeding rate of the cover crop and its effect on greenfeed yield at a site in northeast Saskatchewan.

The purpose of this project was to determine how various seeding rates of a cover crop of oats and barley effect the yield of the cover crop for greenfeed and the yield and establishment of the under seeded meadow brome and alfalfa crop.

C. Method

This trial was seeded at Nipawin in 2000 and 2001 and Melfort in 2002. The cover crops were cut in the year seeded. The under seeded alfalfa brome plots were cut the year following seeding.

The trial consists of a low, medium and high cover seeding rate treatment for each of a barley and oat cover crop along with a no cover crop treatment. Three seeding rates of Rosser barley (27.5 lb./ac, 55 lb./ac. and 110 lb/ac.) and CDC Baler oats (17 lb./ac., 34 lb/ac. and 100 lb/ac.) and the no cover crop treatment were seeded in a randomized completed block design with four replications. Seeding occurred in late May of each year.

The entire trial was under seeded, perpendicular to the cover crop seeding, with a mixture of 8 lb./ac. meadow brome grass and l lb./ac. alfalfa. All cover crop plots were 4 ft. wide x 20 ft long. Row spacing for the cover crop and under seeded forage mixture was 12 inches.

The cover crops were harvested with a plot harvester to a height of 3 inches in early August. At harvest the barley was in the soft dough stage and the oat in the late milk state.

Treatment	Green Feed Yield			Alfalfa/ Brome Yield		
				2000 Seeding		2001 Seeding
	2000	2001	2002	2001	2002	2002
No Cover	2216	1651	1155	4170	1399	811
Oat 17 lb./ac	7122	5819	4618	4640	1497	1176
Oat 34 lb/ac	7888	7016	4682	4850	1639	952
Oat 100 lb/ac	9326	9533	5700	4240	1256	925
Barley 27.5 lb/ac	8431	7975	4295	4720	1080	704
Barley 55 lb/ac	8942	7859	4115	4630	974	811
Barley 110 lb/ac	9092	8458	3901	3780	1519	1517
CV	13	17	11	26	24	19
LSD (0.5)	1508	2129	646	ns	480	339

D. Results

Yield results are provided in Table 1.

Table 1: Greenfeed and alfalfa/bromegrass yields.

It is important to note that the 2001 cover crop data only includes 3 replicates, which had very high variability, I suspect due to dry conditions and location of the plot at the Nipawin site.

The no cover crop treatment yielded significantly less forage in the year of seeding than the cover crop treatments.

In 2000 oat seeded at 17 bu/ac was the only cover crop treatment to yield significantly less than the other oat seeding rates. In 2001 and 2002 oats at 100 lb/ac yielded significantly more greenfeed than the other two oat seeding rates. There was no difference in oat greenfeed yield between the 17 and 34 lb/ac seeding rates.

Barley yield were not significantly affected by seeding rate in any of the three years.

The data indicates that cover crop seeding rate had no effect on the yield of the forage crop the year after seeding.

There was no consistent trend in the quality data to indicate seeding rate or crop had significant difference on quality.

Table 2: Greenfeed and alfalfa/bromegrass protein and ADF levels in the year of seeding.

Treatment	Green Feed Quality					
	2000		2001		2002	
	% P	% ADF	% P	% ADF	% P	% ADF
No Cover	21	36	19	28	24	30
Oat 17 lb./ac	11	39	12	32	14	36
Oat 34 lb/ac	11	38	13	32	14	37
Oat 100 lb/ac	12	38	12	34	14	41
Barley 27.5 lb/ac	12	34	12	28	16	33
Barley 55 lb/ac	11	34	11	34	14	34
Barley 110 lb/ac	10	35	11	30	15	31

E. Discussion

In the three years of this trial oat appears to be more sensitive to seeding rate than barley. For the three seeding rates used in this project barley greenfeed varied from only 8- 15 percent depending on the year. For oats, greenfeed yields varied by 19-39 % depending on the year.

In this study seeding 0.5 bushels of barley for greenfeed was adequate to optimize yield of greenfeed. Oats on the other produced the best greenfeed yields in 2 out of the three years when seeded at 2 bushels per acre.

In this study seeding rate of the cover crop did not significantly affect the second year forage yield of the meadow brome alfalfa mixture. Caution is advised when using the data from 2001. That years data was highly variable. This was a result of the dry growing season at Nipawin and the proximity of the trial to a farm shelterbelt. Another year of data is required to support these findings.

A. Pasture Production of Annuals

Allan Foster, Saskatchewan Agriculture, Food and Rural Revitalization, Tisdale
Linden McFarlane, Agriculture and Agri-food Canada, Melfort

B. Background

Yield is a major consideration in choosing an annual forage crop. Most of the yield data on annual crops comes from silage or greenfeed trials where the crop is cut only once in the summer when the crop reaches the soft dough stage. In most trials using this cutting strategy oats and barley out yields the winter cereals and annual ryegrass. The strategy of only using peak yields works well for silage and green feed comparisons however for pasture production crops are generally grazed before they reach their peak production in order to maintain quality for an extended period. The crop is also often grazed in a rotation 2-3 times. This use of spring crops prior to the soft dough stage reduces overall production. The multiple cutting or grazing of a pasture system can favour plants that can quickly re-grow from intact leaves, such as winter cereals and annual ryegrass.

The objective of this project was to determine the yield and quality of various annual crops under simulated grazing conditions.

C. Method

Nine annual crops were seeded in a randomized complete block design with four replicates at the Melfort Research Farm in the spring of 2002. The crops included were winter wheat, fall rye, winter triticale, oat (Foothills), annual rye grass (Westerwolds and Italian), spring triticale, barley (AC Ranger), Golden German millet. All crops were cut 3 times during the season to determine growth under simulated grazing. Cutting dates were July 19, Aug. 19 and late September. Yield and quality were determined at each cutting date.

D. Results

The yield results for each of the three clipping dates and total yield are provided in Table 1 below.

Table 1: Yield (kg/ha) of nine annual forage crops cut three times during the growing season at Melfort in 2002.

Crop	Cut 1 July 19	Cut 2 Aug. 19	Cut 3 Sept 20	Total Yield 2002
Italian Ryegrass	464 d	2640 a	2334 a	**5439 a**
Annual ryegrass	953 cd	2085 b	2252 a	**5290 a**
Oats	1874 b	984 d	1227 d	**4050 b**
Winter Wheat	336 d	1815 bc	1698 bc	**3850 b**
Winter Triticale	501 cd	1491 c	1797 b	**3789 b**
Spring Triticale	2694 a	781 d	276 e	**3752 b**
Fall Rye	530 cd	1663 bc	1296 cd	**3489 bc**
Golden German Millet	1223 bc	2009 b	251 e	**3485 bc**
Barley	1700 b	270 e	620 e	**2591 c**

Means with the same letter are not significantly different.

E. Discussion

Below normal precipitation, especially in May and June, limited production of all crops at Melfort in 2002. The annual and Italian ryegrasses had the highest total yield with the vast majority of their growth coming after July 20. Oats yielded relatively well compared to the other spring cereals, barley and triticale. This was mainly due to the greater growth experienced from August 19 to the late September cut. The three winter cereals produced similar amounts of dry matter with most of this production coming in the second and third cut. Golden German millet yielded well in the first and second cuts but produced very little growth after the August 19 cut.

In this trial the crops yielding the best were the ones that responded well to the rains received in late summer. The annual ryegrass and Italian ryegrass grew well in response to the precipitation pattern at Melfort in 2002 even though it was drier than normal. Oats was the highest producing spring cereal showing better re-growth characteristics than barley, triticale or Golden German millet.

A. Yield and Quality of Annual Crops for Swath Grazing and Greenfeed when Seeded on Three Different Dates at Melfort.

Allan Foster, Saskatchewan Agriculture, Food and Rural Revitalization, Tisdale
Linden McFarlane, Agriculture and Agri-food Canada, Melfort

B. Background

There are a number of crop options to consider when seeding a crop for green feed, silage or swath grazing. The most reliable have been oats and barley. Interest in triticale for silage has grown over the past few years. Recent research at the Brandon Research Station has indicted that some millets may be well adapted to use as swath grazing crops. Millets are warm season crops. That means they need warmer temperatures mature than our cool season crops like oats and barley. Past experience with millets and other warm season crops have shown when they are seeded in the spring and harvested in early August when our cool season crops are in the soft dough stage, the warm season crops tend to produce less dry matter.

This comparison may have been slightly unfair to the warm season crops since they tend to grow best in July and August if precipitation is available. Since warm season crops like millet take so long to mature they may be better suited to late season use as swath grazing than our cool season crops.

C. Method

Oats and barley were each sown on May 24, June 15 and July 3, 2001 to determine the effect seeding date would have on yield, and quality of the crops for fall swath grazing.

Yield, protein and energy levels for barley were determined when cut at the soft dough stage on July 24 and sampled in the swath on Dec 3 for the May 24 barley seeding date, sampled in the swath on Aug 13 and Dec 3 for the June 15 seeding date and swathed Aug 27 and sampled in the swath on Dec 3 for the July 3 seeding date.

Yield, protein and energy levels for oats were determined when cut at the soft dough stage on July 24 and sampled in the swath on Dec. 3 for the May 24 seeding date, swathed Aug 13, and sampled on Aug 20 in the swath and Dec. 3 for the June15 seeding date and swathed Sept 10 and sampled in the swath on Dec 3 for the July 3 seeding date. Yields do not include yield from growth occurring after the swathing date.

Four samples per sampling date per crop were sent to Enviro-test labs in Saskatoon for protein and energy level determination.

In 2002 the project was expanded to include triticale and Golden German. Oat, barley, triticale and Golden German millet were seeded at the Melfort Research Farm on three seeding dates (Late May, Mid June and Early July) and cut at the soft dough stage for the

cereals or at the early heading stage for the Golden German Millet. Each crop was sampled for quality and yield at swathing and was sampled again for quality on December 1. Quality for the December sampling is not shown.

D. 2001 Results

Swathed yield of oats and barley seeded on June 15 were higher than for either the May 24 or July 3 seeding date (Table 1).

The higher yield of the June 15 seeding date than the May 24 seeding date was probably a result of very dry soil moisture conditions experienced at Melfort in 2001 that affected germination and sped maturity that reduced the yield potential of early seeded crops. In the fall, the May 24 seeded plots of both barley and oats had substantially more re-growth than the other seeding date plots. Re-growth was not sampled in this demonstration.

It was expected that the July seeding date would result in lower yields than seeding earlier in the spring. However because of the dry spring the July 3 seeding date yields equalled the May 24 yields for barley and was better than the May 24 seeding date for oats.

Only a slight decline in protein and energy was noted between the soft dough stage and the Dec 1 sampling date. This was similar for each of the seeding dates and for both of the crops (Tables 2) suggesting that there was little change in forage quality while the crop lay in the swath. Again this preservation in quality was probably a result of the dry fall conditions experienced at Melfort in 2001.

Table 1: Yield and quality of oats and barley and harvest date for oats and barley seeded on three dates in 2001 at Melfort.

Crop	Seeding date	Harvest Date	Yield (Kg/ha)	% Protein	% TDN
Barley	May 24	July 24	3468	14.4	71.4
Barley	June 15	Aug 20	5593	14.3	67.4
Barley	July 3	Aug 27	4072	17.3	66.7
Oats	May 24	July 24	4092	13.3	64.9
Oats	June 15	Aug 20	6733	12.9	62.3
Oats	July 3	Sept 10	5206	11.9	64.6

Table 2: Protein and TDN levels of Oats and Barley sampled from swaths on December 1, 2001 for three seeding dates at Melfort in 2001.

Crop	Seeding date	Harvest Date	% Protein	% TDN
Barley	May 24	July 24	13.5	66.2

Barley	June 15	Aug 20	13.8	64.0
Barley	July 3	Aug 27	15.5	62.1
Oats	May 24	July 24	12.3	57.0
Oats	June 15	Aug 20	11.5	60.4
Oats	July 3	Sept 10	11.9	60.1

Barley had a higher protein and energy content than oats for the May 24 and July 3 seeding dates. Oats had a higher protein and energy than barley at all sampling dates when seeded on July 1.

2002 Results

The cool season crops did not fair well through the dry conditions of the spring and summer. They grew little and matured to the soft dough stage in late July. At this point they were cut. Yields were very low. The Millet although it did not grow well through the drought, remained leafy and was able to respond quickly once we received a few rains in July and August. The oats barley and triticale did produce re-growth, which was cut in late September. Oats produced the most re-growth followed by barley then triticale. In 2002 Millet was the highest yielding of the four crops tested, even when the re-growth of the early cut oat, barley and triticale was included in the yield.

Table 3 provides a complete summary of the one cut yield and quality of the four annual crops used in this project for each of the three seeding dates. In this project Millet produced the highest one-cut yield. This was to a large part due to the fact that, because it did not mature, it was left standing longer than the cereal crops.
The cereals cut May 24 re-grew enough for a second cut in September. The regrowth yields are not included in the table below. The re-growth yields for Barley, Oats and Triticale were 3112, 4459, 2829 kg/ha respectively.

Table 3: Yield and quality of oats, barley, triticale and Golden German millet and harvest date for these crops for three seeding dates in 2002 at Melfort.

Crop	Seeding date	Harvest Date	Yield (Kg/ha)	% Protein	% TDN
Barley	July 3	September 11	6290	14.3	60
Barley	June 22	August 21	4540	14.9	64
Barley	May 24	July 19	2435	15.1	64
G. G. Millet	July 3	September 23	4202	14.7	62
G. G. Millet	June 22	September 16	6765	13.9	60
G. G. Millet	May 24	September 4	7453	12.5	56
Oats	July 3	September 23	5152	14.0	57
Oats	June 22	August 28	6126	12.4	55
Oats	May 24	July 19	2146	14.7	61
Triticale	July 3	September 16	5300	11.5	60
Triticale	June 22	August 28	3931	10.1	62

Triticale	May 24	July 19	2683	11.8	62

The concern with millet is weed control. Green foxtail cannot be controlled in Golden German Millet (or other forage millets) and both are adapted to similar growing conditions. If green foxtail is a problem weed, it is not recommended to grow forage millets.

A. Effect of Fungicide and Cultivar on Barley Leaf Spot Diseases and Yield at Melfort, 2002

H.R. Kutcher and B. Sullivan

AAFC, Melfort

B. Background and Objectives

OBJECTIVE: to determine the impact of Tilt (propiconazole) and Headline (pyraclostrobin) fungicides on leaf spot diseases, yield and quality of various barley cultivars.

FUNGICIDES: Tilt - propiconazole
Headline - pyraclostrobin

CULTIVARS: Harrington, AC Metcalfe, CDC Sisler, Xena, CDC Bold

MATERIALS & METHODS: The experiment was a split-plot design with 6 replicates. Cultivars were main plots and fungicide treatments the sub-plots (4.8 X 10 M).

A preseeding burn-off was conducted with 1.25 L/ha Round-up (glyphosate). The experiment was seeded on summerfallow at the Melfort Research Farm May 21st using a John Deere Hoe Drill. Forty-five kg/ha of 11-51-0 fertilizer was seed placed. Plots were blanket fertilized with 34-0-0 at 84 kg actual N/ha on June 4th. Pardner (bromoxynil) was applied on June 24th for broadleaf weed control. There were few grassy weeds present.

Fungicides were applied at the flag leaf stage, Tilt – July 3rd and Headline – July 4th. Diseases were assessed at the soft dough stage of growth on 25 plants per plot (August 1st). Flag and Flag-1 (penultimate) leaves were assessed on a 0-11 point scale based on the % of tissue infected. Plants were also assigned a rating between 0 –11 based on assessment of disease symptoms on foliage of the whole plant.

Plots were harvested by straight combining on Sept 12th. The harvested area of each plot was 1.25 X10 M.

C. Results: See Table 1. Experimental conditions were poor due to the drought.

D. Conclusions: Disease symptoms in this experiment were light relative to previous years. However, the Headline treated plots appeared to reduce leaf spot symptoms compared to the check for most cultivars, while differenced between Tilt treatments and the check were not as apparent. Due to the severe drought, followed by damp cool harvest conditions, foliar diseases appeared to have had little impact on yield and quality of any of the cultivars.

Table 1. Effect of fungicide treatment and variety on barley foliar disease symptoms, yield, bushel weight (BW), thousand kernel weight (TKW) and % plumb kernel (>6/64") at Melfort, 2002.

Cultivar / Fungicide Treatment	Flag (0-11)	Flag-1 (0-11)	Whole Plant (0-11)	Yield (kg/ha)	BW (kg/hl)	TKW (grams)	%Plump Kernels
Harrington							
Check	2.0 ab	3.1 a	5.0 a	1871 bc	60.6 ab	35.4 bcd	83.8 ab
Tilt	2.1 a	3.2 a	4.9 a	1717 c	59.4 ab	33.9 def	84.1 ab
Headline	1.6 bcd	2.1 de	3.4 de	1917 bc	59.7 ab	34.7 cde	82.6 b
AC Metcalfe							
Check	2.1 a	2.7 abc	4.7 ab	1834 bc	61.3 ab	36.5 abc	88.1 ab
Tilt	1.9 abc	2.8 ab	3.9 cd	1799 bc	61.0 ab	35.8 bcd	87.2 ab
Headline	1.7 a-d	2.2 cde	2.7 f	1840 bc	60.5 ab	36.4 abc	90.3 a
CDC Sisler							
Check	1.4 de	1.8 e	3.0 ef	2322 ab	59.9 ab	31.9 fg	83.4 ab
Tilt	1.7 a-d	2.0 e	3.0 ef	2480 a	59.6 ab	33.0 efg	88.2 ab
Headline	1.0 e	1.2 f	1.6 g	2190 abc	58.5 ab	31.0 g	85.0 ab
Xena							
Check	2.0 ab	2.7 abc	4.2 bc	2014 abc	61.9 a	38.7 a	90.1 a
Tilt	1.7 a-d	2.6 bcd	4.2 bc	2248 abc	60.4 ab	38.2 a	88.7 ab
Headline	1.5 cd	1.9 e	2.8 f	2088 abc	61.2 ab	37.1 ab	85.2 ab
CDC Bold							
Check	2.1 a	3.0 ab	4.5 ab	2330 ab	61.6 ab	37.8 ab	89.1 ab
Tilt	2.1 a	3.1 ab	4.6 ab	2278 ab	58.3 b	37.3 ab	86.6 ab
Headline	1.7 a-d	2.0 e	2.9 ef	2264 abc	58.2 b	37.2 ab	85.4 ab
$LSD_{(0.05)}$	0.4	0.5	0.5	467	2.9	2.1	5.8

A. Effect of Potassium Chloride on Disease Severity and Productivity of Canola and Field Pea

C. Kirkham and H.R. Kutcher

AAFC, Melfort

B. Background and Objectives

OBJECTIVE: to determine the impact of potassium chloride (KCl) fertilization on diseases of canola and field pea in northeast Saskatchewan in 2002.

CROPS: Canola, *Brassica napus* Cultivar 45A71 Clearfield
Pea, *Pisum sativum* Cultivar Espace

MATERIALS & METHODS: Plots were located at NW 7-49-16 West of 2nd with the co-operation of landowner Brent Freedman. The site was a sandy loam and was expected to be deficient in potassium chloride. However, after soil testing Cl was not found to be deficient (67 kg/ha = 60 lbs/ac). Liquid Fertilizer (60-0-0-15) was applied to the entire field prior to experiment establishment. Experimental design was a 6 replicate split plot with KCl treatments (0-0-60) as main plots and crops (canola or field pea) as sub-plots (4 X 10 M). Fertilizer was spread using a Valmar applicator at 0, 100 and 200 kg/ha on June 3rd. After application plots were cultivated to incorporate the KCl, using a Bourgault cultivator with attached tine harrows.

Sub plots of canola and field pea were seeded June 4th with a Fabro disc type drill. The target seeding rate for canola was 150 plants per square meter and 100 plants per square meter for field pea. The experiment was sprayed with Odyssey (imazamox/imazethapyr) herbicide on June 25th at the 3rd node of pea and the 2-4-leaf stage of canola.

Canola petals were tested July 16th in the 0 and 200 KCl treatments for sclerotinia infection. On September 12th disease assessment for blackleg, sclerotinia stem rot and alternaria was conducted to determine severity of symptoms on 50 plants per plot for canola. Mycosphaerella blight and powdery mildew symptoms were assessed on 10 vines per plot of pea. Plots were swathed on September 16th using a New Holland swather. Pea was harvested September 17th and canola October 10th with a Wintersteiger plot combine. Yield samples were assessed for quality data (thousand kernel weight, bushel weight and in canola % green seed).

C. Results: The experiment was established with poor spring soil moisture. Emerging crops were then subjected to low temperatures and a lack of rainfall throughout most of the growing season.

Petal testing of canola indicated no infestation by spores of sclerotinia stem rot. Only trace levels of any of the canola diseases were observed at swathing. Canola yields were extremely low with an average across all treatments of 686 kg/ha (approximately 12 bushels per acre) (Table 1). Differences were not found among treatments for any of the

factors tested, with the exception of % green seed, which was tended to be greater in the check treatment (0 kg KCl/ha) than in other treatments.

Field pea was severely affected by the drought with an experimental average yield of 520 kg/ha. Differences among treatments for diseases, yield or quality were not observed (Table 2).

D. Conclusions: No conclusions can be drawn from the data collected from this test due to the fact that the experimental site was not low in chloride and to the severe growing conditions of 2002. The relationship between KCl fertility and disease could not be determined because of the lack of canola diseases and relatively low levels of field pea diseases. KCl fertility did not appear to impact yield or most quality factors under these experimental conditions.

Table 1. Effect or KCl rates on canola yield (kg/ha), thousand kernel weight (TKW) in grams, % green seeds and bushel weight (kg/hl) at Gronlid, 2002. Data are the means of 6 replicates.

Rate of KCl (kg/ha)	Yield	TKW	% Green seeds	Bushel Weight
0	687.9 a	4.7 a	14.3 a	64.0 a
100	702.1 a	4.8 a	8.8 b	63.7 a
200	670.3 a	4.6 a	9.7 ab	63.9 a
$Lsd_{(0.05)}$	249.2	0.2	4.7	0.6

Table 2. Effect of KCl rates on field pea diseases (mycosphaerella blight (MB) - % of foliage with symptoms in the upper, mid and lower portion of each stem; ascochyta foot rot (AFR) - 0-9 scale; powdery mildew - 0-9 scale), yield (kg/ha), thousand kernel weight (TKW) (grams), and bushel weight (kg/hl) at Gronlid, 2002. Data are the means of 6 replicates.

Rate of KCl (kg/ha)	MB Upper	MB Mid	MB Lower	AFR	Powdery Mildew	Yield	TKW	Bushel Weight
0	9.5 a	26.7 a	41.8 a	2.4 a	6.8 a	507.9 a	181.8 ab	81.9 a
100	10.6 a	24.7 a	46.0 a	2.4 a	7.0 a	510.5 a	186.5 a	82.5 a
200	11.2 a	28.7 a	46.3 a	2.4 a	6.8 a	449.2 a	177.4 b	81.9 a
$Lsd_{(0.05)}$	3.4	10.5	17.1	1.0	0.7	96.4	8.5	0.7

A. Sclerotinia Modelling Final Report February, 2003

H.R. Kutcher and C. Kirkham
Melfort Research Farm, AAFC

B. Summary

Sclerotinia stem rot severity is variable and depends on the time of infection and the climatic conditions during the growing season. Disease prediction models based on data supplied from portable weather stations may aid canola producers making fungicide application decisions for sclerotinia control. The objective of this study was to test the sclerotinia stem rot disease model developed for the uMetos weather stations for its ability to predict beneficial fungicide application for sclerotinia stem rot of canola in northeast Saskatchewan. The model recommended application of fungicide to control sclerotinia stem rot during flowering of the crop once in 2001 and twice in 2002. However due to drought conditions at the test site in both years there was no benefit to fungicide application for sclerotinia stem rot in either year. The model appears to need further refinement, however the weather data itself may be useful to canola producers when making fungicide application decisions.

C. Introduction

The uMetos is an in-field weather station that provides weather information to support an onboard model that is purported to guide fungicide application decisions in a number of crops for various diseases. The decision to apply fungicide to canola is based on a sclerotinia stem rot disease model that is built into the station. The first stage of the model monitors the risk of ascospore production by the pathogen. The model uses the weather data collected to assess risk through a 'checklist'. Weather conditions are recorded and stored. If conditions conducive to apothecia production and ascospore occur the model indicates this by displaying a high-risk warning. There are three levels in the model at this stage. If the model indicates that level 3 has been reached, this is a recommendation for application of fungicide. If the model reaches level 2 but weather becomes unfavorable for ascospore production, fungicide application is not recommended. The second stage of the model monitors the infection levels of ascospores on the plants.

If this equipment and model are accurate it may improve stem rot control by fungicide application. Producers will have access to data on climatic conditions collected from within their own crop canopy or a nearby field instead of from a regional weather forecast. The proposed research will test the disease prediction model for sclerotinia stem rot in canola developed by Pessel Instruments. Weather monitoring systems will be used to supply data for the model to test its benefit/accuracy for Saskatchewan producers.

D. Experimental Protocol

Field operations:

The study was conducted at one site at Melfort each year on fields with a history of sclerotinia stem rot infection. Experiments were designed as randomized complete blocks of 4 replicates. In both years canola was direct-seeded into cereal stubble using a John Deere no till disc drill. The cultivars grown were Exceed at 6 lbs/ac (2001) and Invigor 2153 at 7.5 lbs/ac (2002). At seeding 22 kg/ha of P_2O_5 was applied in-furrow, however no nitrogen was applied since soil testing indicated sufficient levels in each field each year. Dates for all operations are listed in Table 1.

Plots measuring 11 x 15 meters (2001) and 9 X 10 (2002) were implemented. Guard plots and rows were seeded on all sides of the test. Plots were assessed for emergence in the seedling stage. Weed control was achieved with applications of Round-up at 1 liter/ac pre-seed burn-off and Liberty in-crop at 1.35 liter/ac. In 2001 all plots of the experiment were sprayed with Decis to control diamond back moth.

Fungicide treatments were either a contact product (Ronilan 80 DG – vinclozolin) or a locally systemic product (Quadris 250 EC – azoxystrobin). They were applied according to the treatment protocol listed below, either at particular growth stages (pre-bloom and 20-30%) or according to the uMetos weather station model. The weather station was set up in an adjacent canola field of the same cultivar. Treatments 4, 6 and 7 were applied according to the weather station sclerotinia model when a high risk of infection was indicated. The weather station was checked daily during the bloom stage of the canola and treatments applied with 48 hours of a high-risk indicator.

Check plots were evaluated for petal infection weekly during flowering (2001 - 3 weeks; 2002 – 2 weeks. All plots were evaluated for symptoms (% of plants with lesions) of sclerotinia stem rot and blackleg on one hundred plants from each plot just prior to swathing.

All plots were swathed, then harvested using a Wintersteiger plot combine. Data were analysed using analysis of variance procedures.

Treatment list:

1. Check 1
2. Contact fungicide (Ronilan) application at growth stage BBCH 55 (Lancashire et al. 1991) (individual flower buds, main inflorescence, visible but still closed)
3. Contact fungicide (Ronilan) sprayed at 20-30% bloom stage – full rate application
4. Contact fungicide (Ronilan) sprayed according to weather station – full rate application
5. Systemic fungicide (Quadris) sprayed at 20-30% bloom stage – full rate application
6. Systemic fungicide (Quadris) sprayed according to the weather station information – full rate application

7. Split application - two half rates - both contact (Ronilan) according to weather station model
8. Split application – two half rates – systemic (Quadris) first and contact (Ronilan) next.

E. Results

2001

The 2001 crop year was characterized by drought conditions with very little rainfall during the flowering period of the canola crop (Appendix 1). However the weather station model reached a threshold on July 20th indicating that the crop should be sprayed. Treatments 4 and 6 were applied at this time and the early application of the split application treatments 7 & 8: late applications were not made, as the weather station model did not reach a threshold a second time.

Sclerotinia petal infection indicated very low levels of spores present on petals during flowering: July 9 (8.3% infection), July 16 (4.2%) and July 23 (4.2%).

At swathing time no sclerotinia lesions were detected on the plants examined within each plot (Table 2). A low level of blackleg infection did occur. No differences in yield could be detected due to fungicide application. Yields were variable due to poor emergence and variable stand within the experiment. This was due to the dry soil condition at time of seeding and drought throughout the growing season.

2002

The 2002 crop year, like 2001 was characterized by extremely dry conditions, from the previous year until August (Appendix 2). The uMetos weather station model indicated high risk of disease development on the following dates: July 7th and 20th, and August 10th, 13th, 17th, and 18th. Fungicides were applied as indicated in the treatment list beginning just prior to flowering (Treatment 2) and during the flowering stages of the crop (Treatments 3-8).

Due to drought the risk of sclerotinia appeared to be extremely low and this was confirmed by petal testing on July 8th (2% infection) and July 16th (8%).

The incidence of blackleg was greater than in 2001 but was not affected by the fungicide applications (Table 3). Sclerotinia stem rot was not found among the plants sampled from each plot. The dry conditions and short canopy were not conducive for the development of this disease. The relatively low incidence and severity levels of blackleg had no differences among the treatments. The application and timing of Ronilan and Quadris had no impact on any of the factors measured.

Conclusions

The sclerotinia stem rot model, based on data from the uMetos weather station indicated that the crop was at high risk of infection during flowering and recommended fungicide application once in 2001 (July 20th) and twice in 2002 (July 7th and 20th). The model

appears to have a 'hair-trigger' considering the drought conditions that prevailed during both years of testing. It would be of value to test the model again in years conducive to sclerotinia stem rot. The results of this experiment suggest that further refinement of the model is necessary for Parkland conditions. However weather data, combined with weather forecasting and other tools such as the petal test and sclerotinia checklist, is a tool that canola producers may find useful when deciding on fungicide application for sclerotinia stem rot in canola.

Table 1. **Dates of field operations for testing of the sclerotinia model in each year at Melfort.**

Operation	**2001**	**2002**
Seeding	May 12	May 20
Herbicide application		
Burnoff	May 16	-
In-crop	June 13	June 28
Insecticide	July 17	-
Fungicide application		
Prebloom	July 15	July 3
First	July 20	July 9
Second	-	July 22
Disease assessment		August 23
Swathing	August 20	August 27
Combining	September 5	September 23

Table 2. Emergence, incidence of blackleg and sclerotinia stem rot symptoms and yield for fungicide treatments listed above at the Melfort Research Farm in 2001.

Treatment	**Emergence (plants/m^2)**	**Blackleg Incidence (%)**	**Sclerotinia Incidence (%)**	**Yield (kg/ha)**
1	79	2.5	0	1364
2	105	1.3	0	1460
3	79	2.8	0	1158
4	81	1.0	0	1039
5	67	2.0	0	1104
6	81	2.3	0	1358
7	79	3.0	0	1088
8	73	1.5	0	961
$Lsd_{(0.05)}$	23	2.1		573

Table 3. Emergence, incidence of blackleg and sclerotinia stem rot symptoms and yield for fungicide treatments listed above at the Melfort Research Farm in 2002.

Treatment	Emergence (plants/m^2)	Blackleg Incidence (%)	Sclerotinia Incidence (%)	Yield (kg/ha)
1	88	15.3	0	510
2	92	14.3	0	514
3	84	17.5	0	585
4	100	16.0	0	501
5	82	13.5	0	602
6	68	12.3	0	607
7	91	15.0	0	523
8	98	17.5	0	598
$Lsd_{(0.05)}$	29	7.6		194

Saskatchewan Conservation Learning Centre
Prince Albert

Laurie Hayes - Manager

The Conservation Learning Centre (CLC) was established in 1993 through the Parkland Agriculture Research Initiative and Green Plan. In 1997, it was incorporated as a non-profit corporation with charitable status. The CLC has a strong working relationship with Agriculture and Agri-Food Canada, PFRA, Saskatchewan Agriculture and Food and the University of Saskatchewan.

The CLC encompasses 480 acres (W ½ and SE ¼ 20-46-26-W2, Rural Municipality of Prince Albert #461). The land is currently under lease from the landowner to Ducks Unlimited (contract expires March 2002) who, in turn, contributes land rental costs to CLC. The mission of the CLC is to be a demonstration site to provide information to farmers, public school students, researchers, extension workers, and the urban public in the parkland area of Saskatchewan regarding land management techniques that focus on the optimum utilization of the landscape for annual crop and forage production, employ appropriate soil and water conservation techniques, and facilitate wildlife habitat enhancement.

Saskatchewan Conservation Learning Centre Tours and Demonstrations

A. Field days:

- June 14-15: CIDA / PFRA / Inner Mongolia Direct Seeding Demonstration and Tour
- July 14: Agriculture Institute of Canada Annual Conference Tour
- July 23: CLC General Tour
- July 30: PCAB Tour
- April 29 – June 25, August 19 and September 18 – October 22, 2003: School tours (1,681 students)

B. Projects

1. Disease / Insect Decision Support Models

Weather station: May 7 to October 21, 2002
Precipitation: 11.21" (5.39" in August)
Evapotranspiration: 26.54" (7.03" in July). Evapotranspiration is the sum total of moisture that is evaporated from the soil naturally and transpired from the plant.

Bertha army worm survey: CLC continues to act as a monitor for populations of bertha army worms.

Aster yellows: Aster yellows, a phytoplasma disease, is transmitted by leafhoppers and infects a wide range of hosts, including canola, and could have a significant economic impact in the future. The CLC was again the site for research by Agriculture and Agri-Food Canada into aster yellows and its impact on canola and related species.

Different plant families and *Brassica rapa* cultivars were evaluated. *Brassica rapa* cultivars was used in a separate trial based on the high rate of aster yellows infection in previous trials. In the family trials, canola, Pak choi, lettuce, asters, field peas, barley, carrots, potatoes and flax were studied. Carrots and flax had the highest levels of aster yellows. Eleven *Brassica rapa* cultivars were seeded but results were variable with relatively low levels of infection.

Precision farming aspects: Due to the lack of moisture, we did not utilize the sclerotinia prediction model as a guide for timing of fungicide application.

2. Do's & Don't of Direct Seeding – Post Emergent Burn-off Demonstration (Garry Mayerle, SSCA)

Direct seeders have found delaying a burn-off application of glyphosate until just before the crop emerges gives a much cleaner crop and may reduce dollars spent on in-crop herbicides. This works especially well on early seeded pulse crops that emerge slowly because of cool soils and deeper seeding. However, there is the risk that weather conditions will further delay the application until after the crop has emerged, negating the

benefits. Some producers claim that even though seed rows were visible, they applied glyphosate and had no damage.

SSCA had several demonstration sites showing the effects of post-emergent glyphosate application. At the CLC, the effects on wheat were demonstrated. Treatments were application at ground crack and 1, 2 and 3 days after ground crack. Plots were sprayed on June 14, 15, 16 and 17. Water rates were 10 gal /ac with a ½ L/ac of Roundup Transorb. Spraying conditions were quite good each of those days.

To determine the effect on specific plants, 0.5 to 1 meter segments of certain rows were flagged and each individual plant in the segment was tagged with a colored wire loop anchored in the soil. These plants were tagged just before spraying.

	Plants emerged at spraying time	Live plants one (1) month after spraying	Plants emerged after spraying
Treatment	*Plants/m²*		
Ground crack plus 1 day	36	6	80
Ground crack plus 2 days	124	11	20
Ground crack plus 3 days	122	8	6

A significant portion of crop plants that are photosynthesizing when sprayed will die or be severely affected by the glyphosate. Producers must weigh the risks of reduced crop stands especially if weather delays glyphosate application 24 hours after ground crack against the benefits of enhanced weed control. If there are a high percentage of crop plants that emerge after application, yield may not be affected. If most of the crop has emerged at application, yield will likely be significantly reduced.

3. Riparian Area Management Demonstration

This project addresses the use of marginal land bordering wetlands. To establish a protective riparian barrier as well as optimizing production in these areas, a forage mix will be seeded around the water bodies, linking several together to form a larger block. The field containing this area was seeded to Clearfield canola but due to the potential problems with herbicide residue (exacerbated by the lack of moisture), the proposed riparian areas were blocked and seeded to Roundup Ready canola. The site will be seeded in the spring of 2003 with a mixture of intermediate wheatgrass, smooth bromegrass and alfalfa.

An economic assessment will also be completed, measuring the savings through reduced overlapping of inputs when seeding around waterbodies and the income garnered from the production of hay.

4. Shelterbelt and Woodlot Demonstration

Shelterbelt: Twenty-four shelterbelt species recommended for yard, field, wildlife shelterbelts and forest belts in the parkland region were planted in 1994 and 1995 to create a shelterbelt garden. Survivability (dead / planted) was measured in 2001:

Dogwood	21 / 22	Hedge Rose	24 / 28	Red Elder	12 / 20
Lilac	22 / 22	Sea Buckthorn	23 / 23	Buffaloberry	22 / 22
Saskatoon	23 / 24	Pin Cherry	19 / 21	Chokecherry	16 / 16
Red Pine	12 / 17	White Spruce	9 / 10	Siberian Larch	11 / 11
Jack Pine	11 / 11	Colorado Spruce	9 / 9	Scots Pine	9 / 9
Paper Birch	11 / 12	Green Ash	12 / 14	Manitoba Maple	11 / 11
Russian Olive	5 / 11	Silverleaf willow	11 / 12	Acute Willow	10 / 10
Aspen	7 / 13*	Assiniboine poplar	0 / 21*	Walker Poplar	2 / 11*

Most of the dead aspen, Assiniboine poplar and Walker poplar trees were killed by spray drift in 1996. Replacements have been planted in 2001 and 2002 but did not establish well due to the lack of moisture. Plastic mulch was used to control weeds around the trees and grass was seeded between rows.

White Spruce Field Shelterbelt: White spruce was planted in the spring of 1994 along the northern boundary of the northwest quarter to establish an evergreen shelterbelt (one-half mile). The spruce also add aesthetic value to the area as well as diversifying the habitat and providing some harvestable value when mature. Survival has been very good with growth slow, but constant. Some trees in the low-lying areas have drowned. Weeds have been controlled through a combination of wood chips and applications of Roundup.

Green Ash Field Shelterbelt: Green ash trees were planted in 1994 along the northern boundary of the southeast quarter (one-half mile) to establish a deciduous tree shelterbelt. On one section, the growth rate and survival of the green ash has been adversely affected by the lack of a buffer strip to the north. For the past two years, dead trees have been replaced but again, drought has had an impact on survival. Due to the lack of a grass buffer on the north side, fostering a constant source of weeds, weed control remains difficult despite applications of Roundup and a new layer of wood shavings.

Woodlot: A three-acre woodlot was developed in 1994 to demonstrate species with potential for cash value, wildlife habitat, aesthetic value and yard shelter: hybrid poplar, white spruce, Siberian larch, Jack pine, Scots pine, paper birch, and Siberian larch. Initial weed control was the use of Roundup but the grass has filled the spaces between rows and trees, effectively controlling the weeds. Many Jack pine and Scots pine were planted in an area where the water table is high and have died. In that area, acute leaf willows have been planted.

Several Siberian larch were planted as part of a "line" test, evaluating parent lines. As there has been good growth at the CLC, it has been proposed that these trees be used as seed stock for future trials. This would necessitate removing not only the poor ones but also more to get adequate spacing for seed production.

5. Dense Nesting Cover

In 1993, a dense nesting cover was sown, containing a mixture of 37% intermediate wheatgrass, 10.5% slender wheatgrass, 10.5% meadow bromegrass, and 37% tall

wheatgrass and 5% alfalfa. The area is managed for habitat for ducks, birds and other wildlife species.

In 2001, the area was inspected for nesting cover quality and it was concluded that the stand would benefit from management in 2002. In 2002, the area was swathed and baled for hay production. Yield was ~1 ton per acre. The quality was lower due to the accumulated dense nesting material. The Wetland Wonder Nature Trail that winds through the dense nesting cover continues to be an integral component of the school program.

6. Wildlife Corridor / Fruit Shrub Production

Wildlife corridor: A forest belt was designed to incorporate existing bush and wetland, providing a wildlife corridor. It consists of three to five rows of a mixture of poplar, white spruce, Siberian larch, willow, and fruit-bearing shrubs. Species were selected for future harvest value, high wildlife habitat potential and to fit with the landscape provided.

Survival has varied depending on site preparation, location and tree species, but overall, the trees are healthy and weed control through application of Roundup and wood chips is acceptable.

Fruit Shrub Production: A half-acre area was planted to chokecherry, pin cherry, and saskatoon bushes in 1996 with plastic mulch applied to control weeds. Clover was direct seeded between the rows. Grass and clover have grown in to cover the area between rows and are effectively controlling weeds. The plastic mulch has served its initial purpose to aid establishment of the trees and is beginning to wear.

In 2001, two types of honeysuckle were planted by the University of Saskatchewan for evaluation. All trees appear to be established, despite the drought conditions.

7. Safe Storage of Fuel and Fertilizer

Preliminary plans for the establishment of a containment system in the event of a fuel or liquid fertilizer spill were implemented. A "pit" has been dug deep enough to contain 110% of the volume of one tank (1400 gallons). Next spring the berm walls will be built and seeded to grass. Bentonite will be mixed with the soil to a depth of 6" and packed to seal the pit. The tanks will be placed on crushed rock inside the berm.

8. Saskatchewan Forage Variety Trials

Forage variety testing plots were seeded into canola stubble in June 2002. Trials were set-up as randomized complete block design and replicated four times.

Legumes seeded:

- Alfalfa: Hornet, AC Nordica, Algonguin, Beaver, Rangelander, AC Longview, Alouette, Barrier, Dekalb 120, Proleaf, True North, 53Q60, AC Grazeland (reduced bloat)
- Cicer milkvetch: Windsor, Oxley, Oxley II
- Nova sainfoin

- Cree birdsfoot trefoil.

Grasses seeded:

- Crested wheatgrass: Fairway, Kirk
- Arthur Dahurian wildrye grass
- Chief intermediate wheatgrass
- Climax timothy
- Smooth bromegrass: Carlton, Radisson
- AC Knowles hybrid bromegrass
- Meadow bromegrass: Meadow, Paddock
- Kay orchardgrass
- Courtenay tall fescus
- Prairieland Altai wildrye
- Boreal creeping red fescue.

The lack of moisture had a negative impact on establishment, which will be further evaluated in the spring of 2003. There is some speculation that the canopy from weeds did help protect some varieties during the hot dry weather.

9. Forage Oat and Barley Demonstrations

Demonstration plots were directed seeded in canola stubble on June 6 with an Edwards hoe drill. Varieties demonstrated: a) Forage barley: AC Ranger, Westford, Dillon, AC Rosser, AC Harper, CDC Dolly; and b) Forage oats: CDC Baler, CDC Boyer, AC Murphy, AC Morgan. There were also plots of Golden German foxtail millet and AC Superb hard red spring wheat. Plots were sprayed with Target. With the exception of the millet, varieties performed poorly due to the extremely dry conditions experienced in 2002.

10. Termination of Established Alfalfa Stand

A variety of herbicides were sprayed in 2001 to terminate an established alfalfa stand. The intent was to evaluate the different plots in 2002 and complete the termination. However, due to the lack of moisture, the comparisons were not considered valid and the plots will be completed in 2003.

Western Applied Research Committee
Scott

Sherrilyn Phelps - Agri-ARM Manager

Scott Research Farm is a satellite of AAFC – Saskatoon Research Centre. Various small plot research projects are conducted at the farm. One of the larger experiments is an alternative cropping study which compares organic, reduced input, and high input systems. Six out of 18 years of this study are now complete. In the past, Spoke projects have been placed in a designated area on the research farm, usually 3-4 acres, and have had special signage. In March 2002, a producer group was formed to help provide direction for Agri-ARM projects at Scott. The group consists of Members from each of 6 ADD districts in NW Saskatchewan with District 30 ADD board providing administration and affiliated membership from AAFC-Scott and SAFRR.

Additive Effects of Group 2 Herbicides on Crop Tolerance and Re-cropping Restrictions

Eric N. Johnson, Scott Research Farm

Summary

Group 2 herbicides are the most widely used herbicides on the prairies and many have residual activity. There is very little information on the prairies as to the consequences of back to back yearly applications of different Group 2 herbicides. A long-term prairie wide study has been initiated to investigate the potential additive effects of Group 2 herbicides.

Background and Objectives of Study

Herbicides are a major expenditure for prairie producers. Saskatchewan producers spend about $ 460 million dollars annually on pesticides, the bulk of which are herbicides. Seventy-five percent of the herbicides sold in Canada are sold in Western Canada. Group 2 herbicides (ALS inhibitors) are the most widely used herbicides on the Prairies. Many of these herbicides have residual activity that can damage rotational crops. There is no information available on the effect of "stacking" Group 2 products. For example, applying Odyssey to a field pea crop, followed by the application of Sundance to a subsequent wheat crop. Does the combination of the two products increase injury to the wheat crop? Does the application of the two herbicides in back to back years increase the injury potential to a sensitive crop in year 3?

Research projects such as this are unlikely to facilitate label changes and it is an area where private industry does minimal research. The role of this research is to examine if an interaction between Group 2 products from different manufacturers actually occurs under field conditions. Currently there is no or limited fieldwork to indicate whether this occurs when products and follow-crops are conducted as per the existing product labels.

The objective of this proposal is two-fold:

1) to determine if applications of Group 2 herbicides in two successive years increase crop injury in the second year of application to field pea and wheat;
2) to determine if application of Group 2 herbicides in two successive years result in increased plant-back sensitivity in susceptible crops.

Study Description

Materials and Methods

The study is being conducted in numerous locations across the prairies. The locations are: Scott Research Farm (dark brown soil zone), Melfort Research Farm (black soil zone), Lethbridge Research Center (dark brown soil zone), Kernen Crop Research Farm - Saskatoon (dark brown soil zone), and the University of Alberta - Ellerslie (black soil zone). In addition, BASF is conducting similar experiments near Vanscoy, SK. (dark brown soil zone), Vegreville, AB (black soil zone) and Peace River, AB. (grey soil zone). These locations represent a wide range of soil and climactic conditions.

Two field experiments are being conducted at each location. The first experiment is a wheat-field pea-barley-canola rotation and the second is a field pea-wheat-canola rotation. The experiments were seeded on fallow in 2002. Tables 1 and 2 illustrate the proposed crop and herbicide rotations for both experiments.

Results / Discussion / Conclusions

There is little to report from the first year of this study since it is a long-term study. All treatments were applied in preparation for the second year of the experiment. The Everest treatments caused some yellowing and crop shortening on the spring wheat. A meeting of all collaborators was held in November to discuss second year activities.

Indication for further development

The study, once completed, will identify if "stacking" of residual Group 2 herbicides occur in the field and identify the soil and climatic conditions where the risk is highest. BASF and Dow have provided financial assistance to the project and other companies will be approached for additional financial support.

Table 1: Experiment 1 protocol for group 2 stacking study.

Treatment	Year 1	Year 2	Year 3 (Split)		Year 4
	Wheat	Field Pea	Barley	Wheat	RR Canola
1	Assert	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
2	Assert	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
3	Assert	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
4	Refine Extra	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
5	Refine Extra	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
6	Refine Extra	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
7	Sundance	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
8	Sundance	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
9	Sundance	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
10	Spectrum	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
11	Spectrum	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
12	Spectrum	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
13	Frontline	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
14	Frontline	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
15	Frontline	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
16	Everest	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
17	Everest	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
18	Everest	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
19	Check	Untreated	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
20	Check	Sencor	Achieve/Buctril-M	Achieve/Buctril-M	Roundup
21	Check	Odyssey	Achieve/Buctril-M	Achieve/Buctril-M	Roundup

Table 2: Experiment 2 protocol for group 2 stacking study

	Year 1	Year 2	Year 3 (split)	
Treatment	Field Pea	Spring Wheat	RR Canola	Clearfield canola
1	Check	Check	Poast/Muster/ Lontrel	
2	Check	Assert	Poast/Muster/ Lontrel	
3	Check	Everest	Poast/Muster/ Lontrel	
4	Check	Sundance	Poast/Muster/ Lontrel	
5	Check	Frontline	Poast/Muster/ Lontrel	
6	Odyssey	Check	Poast/Muster/ Lontrel	
7	Odyssey	Assert	Poast/Muster/ Lontrel	
8	Odyssey	Everest	Poast/Muster/ Lontrel	
9	Odyssey	Sundance	Poast/Muster/ Lontrel	
10	Odyssey	Frontline	Poast/Muster/ Lontrel	

Annual Forages – Suitability for NW Saskatchewan

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Summary

The purpose of the study was to evaluate the suitability of annual crops for forage production in NW Saskatchewan. Trials were conducted at Loon Lake, SK and Scott, SK in 2002. The warm season cereals (German millet, corn and sorghum), cool season cereals (barley, hooded barley, oats, triticale) and pulses (peas, fababeans, and fenugreek) were evaluated for forage yield (dry matter production kg/ha) and forage quality (TDN, RFV, %protein). When an early fall frost was present(as in the Scott location), oats was superior to all warm season crops but was not significantly different than the other cool season cereals of barley, hooded barley and triticale. With no early fall frost, as at Loon Lake, the warm season german millet crop outperformed oats and triticale but was no different than barley, hooded barley, and corn. With the pulse crops, fababeans and peas produced yields comparable to the cereals at Scott in 2 out of the 3 seeding dates, but yields were lower than the cereals at Loon Lake. Sorghum and fenugreek did not produce acceptable forage yields as establishment of these two crops was a problem.

Background and Objectives of Study

Livestock production in NW Saskatchewan has been increasing. With the increase there is a need to increase forage production to meet the increasing demand for feed. Research in Canora and SE Saskatchewan indicates good yields with the warm season crops such as millet, sorghum and corn. Traditionally, cereals such as oats and barley, have made up the majority of greenfeed acres in the NW but there is more and more interest in the warm season cereals as an opportunity to increase dry matter and have quicker regrowth.

Study Description

Materials and Methods

The study was conducted at Scott and Loon Lake, Saskatchewan in 2002. Ten forage crops were seeded in a randomized complete block design (RCBD) with four replicates (Table 1).

The trials consisted of early (mid May) and late (early June) seeding dates at both locations. The trial at Scott also had a third seeding date (mid June) due to poor moisture conditions for the first two seeding dates. Actual seeding dates were May 18, June 4, and June 17 at Scott, and May 17 and June 5 at Loon Lake.

Table 1. Treatments for annual forage trial 2002.

Treatment	Crop Type	Seeding Rate
Hooded barley (var. Westford)	Cool cereal	124 lbs/acre
Barley (var. Merritt)	Cool cereal	124 lbs/acre
Oat (var. CDC Boyer)	Cool cereal	100 lbs/acre
Fababean (var. Earlybird)	Cool cereal	150 lbs/acre
Corn (var. HL014)	Warm cereal	30,000 plt/acre
Sorghum Sudan grass	Warm cereal	8 lbs/acre
Golden German Millet	Warm cereal	20 lbs/acre
Pea (var. CDC Handel)	Pulse crop	165 lbs/acre
Fenugreek	Pulse crop	14 lbs/acre
Triticale (var. AC Ultima)	Pulse crop	130 lbs/acre

The plots were direct seeded into wheat stubble using a cone seeder with 12 inch row spacing at the seeding rates listed in Table 1. All cereal plots were banded with fertilizer at an application rate of 190 lbs/acre of 35-17-0 blend. TagTeam granular was applied infurrow for the pulse crops.

Dry matter and wet weights were obtained from each plot by taking two ¼ metre square above ground samples. The two samples were bulked and weighed to obtain wet weights. The samples were then dried in an oven to obtain dry weights. The samples for each treatment per seeding date were then bulked, ground, and a subsample sent for forage analysis at EnviroTest Labs in Saskatoon.

Results and Discussion

The dry matter results from the annual forage plots at Scott and Loon Lake are shown in Table 2. The Loon Lake site had higher yields than the Scott site as there was more severe early August frost and drought at Scott. In general, the cool season cereals produced more dry matter than the warm season cereals at Scott as a result of the early August frost. This is very evident with the June 17th seeding date as the warm season crops had greatly reduced dry matter while the cool season cereal forage yields were unaffected by the frost. With the pulse crops, the pea and fababean crops fared well at Scott. Fenugreek produced the lowest forage yields and there was no fenugreek plants present at the June 17 seeding date. Seed quality and emergence was an issue with fenugreek at both Scott and Loon Lake.

Table 2. Dry Matter yields for the annual forage crops across all locations and seeding dates in 2002.

	Scott				Loon Lake			ALL
	18-May	4-Jun	17-Jun	Ave.	17-May	5-Jun	Ave.	Ave.
Crops	Dry Matter (kg/ha)							
Hooded barley	2958 *ab*	1848 *c*	2828 *b*	2544 *b*	3451 *ab*	3916 *b*	3683 *b*	3000 *a*
Barley	2623 *abc*	2065 *bc*	2898 *b*	2528 *b*	3400 *abc*	4169 *b*	3784 *b*	3031 *a*
Oats	3368 *a*	2735 *abc*	3575 *a*	3226 *a*	2914 *bcd*	3631 *bc*	3272 *b*	3244 *a*
Triticale	1743 *cd*	3118 *a*	2618 *b*	2493 *b*	1762 *ef*	2569 *d*	2165 *c*	2362 *bc*
German Millet	2140 *bc*	2610 *abc*	1265 *d*	2005 *cd*	3982 *a*	4864 *a*	4423 *a*	2972 *a*
Corn	1628 *cd*	2440 *abc*	763 *e*	1610 *d*	4286 *a*	3253 *c*	3769 *b*	2474 *b*
Sorghum	930 *de*	1860 *bc*	358 *f*	1049 *e*	2139 *def*	1167 *f*	1653 *c*	1291 *d*
Pea	1965 *bc*	2585 *abc*	2593 *b*	2381 *bc*	1289 *f*	2081 *de*	1685 *c*	2102 *c*
Fenugreek	328 *e*	2313 *abc*	0 *f*	880 *e*	2345 *de*	1564 *ef*	1954 *c*	1310 *d*
Fababean	2343 *abc*	2825 *ab*	2175 *c*	2448 *bc*	2437 *cde*	1555 *ef*	1996 *c*	2267 *bc*
LSD ($p<0.5$)	1028	977	375	474	993	641	578	363

Note: Values with the same letters are not significantly different in the corresponding column.

At Loon Lake the warm season cereals performed better than at Scott. Golden german millet produced the highest average yield and corn produced yields similar to the cool season barley and oats when both seeding dates were averaged. Triticale and sorghum were the lowest yielding cool and warm season cereals at Loon Lake. Within the pulse crops there was no significant difference between fababean, pea, and fenugreek.

When all sites and seeding dates were combined the highest yielding crop was oats, but yields were not significantly better than barley, hooded barley or golden german millet at $p<0.05$. Sorghum, and fenugreek produced the poorest yields overall and may be the result of poor seed quality as establishment of these crops was very poor with some seeding dates. Pea as a forage yielded similar to fababeans and triticale in terms of dry matter produced.

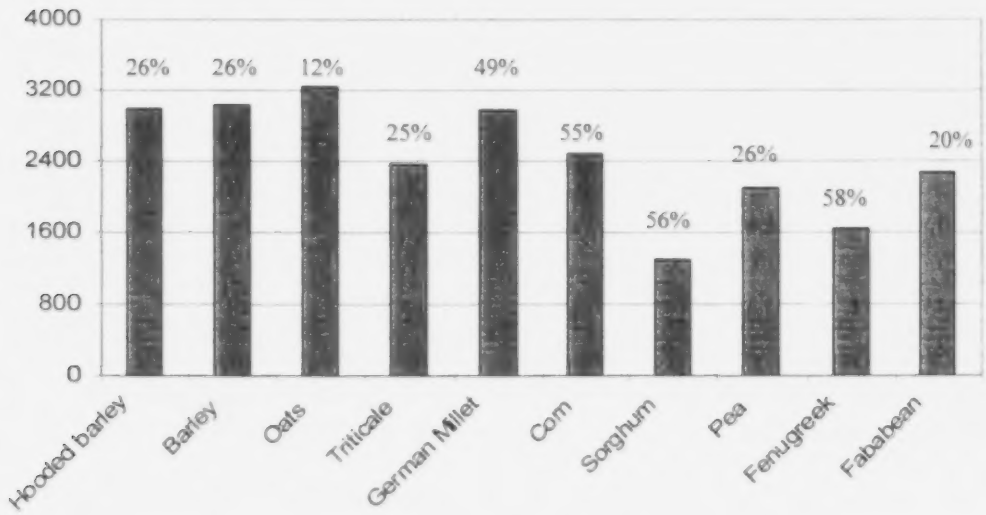
There was an interaction of seeding date and treatment at both the Loon Lake and Scott locations. The Scott location had higher dry matter production of the cool season cereals and lower production of the warm season cereals, with the exception of triticale, with the June 4 seeding date compared to the earlier seeding date of May 18. The pulse crops also produced more dry matter with later seeding on June 4. The differences of seeding date in Scott may be the result of warmer soils for the warm season cereals. The latest seeding date in Scott was June 17. At the latest seeding date at Scott, the yields of the warm season cereals was greatly reduced as a result of early August frost. The frost did not affect the cool season cereals or the peas but did affect fababean to some degree as there

was blackening of leaves and pods. The corn and sorghum were affected more than the german millet as their growth was completely stopped. The german millet had frost damage to the leaves but resumed growth.

At Loon Lake the later seeding date produced the highest forage yields for the majority of the cereals with the exception of corn and sorghum. Fababean and fenugreek had reduced yields with later seeding than did peas.

Figure 1 show the results of average production over all the trials in terms of dry matter yields produced. The top four overall crops for annual forage production were oats, barley, hooded barley and german millet. The next four annual forage crops with medium production were triticale, corn, pea and fababean. The lowest producing forage crops were sorghum and fenugreek.

Figure 1. Average dry matter yields of all the annual forage crops over 5 seeding dates and 2 locations. CV (Coefficient of variation) for each forage are located at top of each bar.



Although average yields are similar with the top four producing forages, the consistency as to amount of forage produced is very different. The CV (coefficient of variation) values shown in Figure 1 express the standard deviation per trial as a percentage of the average mean for that forage. In other words, the variability in forage yield from trial to trial is expressed as a percentage of the overall mean for that forage. The higher the CV value the more variable the yields. From this figure it is clear that although the yields are similar between oat, barley and german millet the variability is very different. Oat has the lowest variability with a CV value of 12% whereas barley has CV value of 26% and german millet is at 49%. The warm season cereals had higher CV's than the cool season

cereals in this experiment thus suggesting that yields of warm season cereals are more variable than the cool season cereals.

The moisture content of the forages at sampling time shows the variation between crops (Table 2). The cool season cereals of barley, oats, and triticale had lower moisture contents than the cool season crops of German millet, corn and sorghum. This suggests that the cool season crops were more advanced and closer to maturity than the warm season crops. The pulse crops varied in moisture content due to differences in maturity as well. The peas contained less moisture than the fababeans and were closer to maturity than the fababeans.

Table 2. Percent Moisture of annual forage crops. Averages of two seeding dates at Loon Lake and the late seeding date at Scott.

	Average % Moisture	St. Dev.(%)
Hooded Barley	55	10
Barley	46	5
Oats	53	6
Triticale	39	12
German Millet	70	3
Corn	74	7
Sorghum	72	6
Peas	51	19
Fenugreek	66	4
Fababean	74	12

The dried forage material from the Loon Lake June 5th seeding date was chosen to be submitted for forage analysis and results are depicted in Table 3. There was no real difference between the cool and warm season cereals in terms of protein and nutrients. The relative feed value (RFV) was highest for barley and lowest for golden german millet. The real difference in the forage anlysis is the increase in protein and RFV with pulse crops.

Table 3. Forage analysis results from Loon Lake late seeding date annual forage trial.

	ETL Forage Anlaysis based on 100% Dry Matter Basis										
	Protien	Na	P	K	Ca	Mg	NDF	ADF	RFV	TDN	DE
	%	%	%	%	%	%	%	%	%	%	%
Hooded Barley	12.8	0.2	0.3	1.5	0.4	0.2	50	26	129	71	3.1
Barley	12.6	0.1	0.2	1.4	0.4	0.2	46	23	142	74	3.2
Oats	12.5	0.1	0.3	1.6	0.6	0.2	49	29	126	68	3.0
Triticale	12.3	0.0	0.3	1.1	0.4	0.2	50	27	125	69	3.0
German Millet	12.8	0.0	0.2	2.7	0.6	0.4	56	28	111	68	3.0
Corn	12.4	0.0	0.3	1.5	0.5	0.3	51	26	124	70	3.1
Sorghum	16.3	0.0	0.2	2	1	0.5	56	27	112	70	3.0
Peas	16	0.0	0.2	0.9	3	0.6	37	21	182	76	3.4
Fenugreek	18.4	0.3	0.2	1.2	2.7	0.4	34	25	192	72	3.2
Fababean	19.5	0.1	0.2	1.3	1.6	0.4	37	23	178	74	3.3

NDF = neutral detergent fibre
ADF = acid detergent fibre
RFV = relative feed value
TDN= total digestible nutrients
DE = digestible energy

Conclusions

Based on results obtained from the two sites in 2002 it is apparent that yield potential differs between annual forage crops. Despite the drought yields still reached 4800 kg per hectare. Further research is required to confirm the yield potential under average moisture conditions and to further evaluate the effect of seeding date on the warm versus cool season annual forages.

Indication for Further Development

It is apparent that the relative performance of annual forage species is highly influenced by conditions associated with where the crop is grown and when it is seeded. This suggest that some species have characteristics that are beneficial under one set of conditions and less so under others. A more comprehensive understanding of how each species responds to growing conditions like soil and climate is essential in developing methods of predicting their performance in the future. In the short term, research should focus on identifying those crop species that have the greatest potential as annual forages.

A. Chemical control of absinthe

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B. Summary

Absinthe is a difficult to control weed. Pre-seed burnoff was not successful at controlling absinthe as none of the pre-seeding herbicides provided satisfactory control of absinthe at the rates tested. Amitrole-T provided the highest initial control; however, control was similar to other herbicides by late June. With the post-emergence herbicide applications the best control was provided by herbicides that contained chlopyralid and fluroxypyr Prestige, which contains both products provided satisfactory in-crop control, but the presence of fall re-growth suggests that control will not be long-term. The 5.1 litre acre^{-1} rate of Amitrol 240 did provide good control of absinthe but it may not be economic to use the high rates.

C. Background and Objectives of Study

Absinthe is a weed that is typically found in rangeland and roadsides but it is becoming more prevalent in zero-till fields. It does not tolerate cultivation but many zero-till producers are reluctant to use tillage for weed control. Without tillage, absinthe is a difficult perennial weed to control. The objective of this study was to evaluate a number of pre- and post-emergence herbicides for the control of absinthe.

D. Study Description

Materials and Methods

Three screening experiments were conducted on a farmer's field near Rockhaven, SK.

Experiment 1:
A number of pre-emergence herbicide treatments were applied on May 7, 2002. Herbicide treatments were applied in a randomized complete block with 2 replicates. The treatments were:

Treatment	*Rate*
1 Vantage Plus (glyphosate)	0.5 liter/acre
2 Vantage Plus (glyphosate)	1.0 liter/acre
3 Pre-Pass (florasulam + glyhosate)	0.5 + 0.04 liter /acre
4 Pre-Pass (florasulam + glyphosate)	1.0 + 0.08 liter/acre

5	Vantage Plus + Express	0.5 liter + 4 g/acre
6	Vantage Plus + Express	1.0 liter + 4 g/acre
7	Vantage Plus + Banvel II (+ Agral 90)	0.5 + 0.12 liter/acre 1.7 liter/acre
8	Amitrol-T	
9	Untreated	

Experiment 2:
A number of post-emergence herbicide treatments were applied to durum wheat when the crop was in the 2-3 leaf stage. The absinthe ranged in height from 4 to 8 inches. All herbicide treatments were applied at label rates with the exception of 2,4-D ester. The treatments were:

1) Frontline-D (2,4-D ester and florasulam)
2) 2,4-D ester 700 (0.32 liter/acre)
3) 2,4-D ester 700 (0.64 liter/acre)
4) Spectrum
5) Attain
6) Prestige
7) Dyvel
8) Untreated

Experiment 3:
The third experiment was conducted to determine the rate of Amitrole 240 required to control absinthe. In experiment 1, there appeared to be an indication that Amitrole 240 applied at 1.7 liter/acre was superior to glyphosate in controlling absinthe. Amitrole was applied on June 21 at rates of 1.7, 3.4, 5.1 and 6.8 liter/acre when the absinthe was in the pre-bud stage.

Visual control ratings were conducted twice during the growing season on all experiments.

E. Results and Discussion

Experiment 1:
Results are presented in Table 1. None of the pre-seeding herbicides provided satisfactory control of absinthe at the rates tested. Amitrole-T provided the highest initial control; however, control was similar to other herbicides by late June.

Experiment 2:
Results are presented in Table 2. The best control was provided by herbicides that contained chlopyralid and fluroxypyr. Prestige, a product that contains both these active ingredients, was the only herbicide to provide greater than 80% top-growth control. It was evident that the absinthe was beginning to show signs of regrowth with all herbicide treatments by the second rating date. Therefore, growers should not expect long-term control with any of these post-emergence treatments.

Experiment 3:
Amitrol 240 applied at rates of 1.7, 3.4, 5.1 and 6.8 resulted in control ratings of 47, 78, 85, and 80% on August 8, 2002. The 5.1 liter/acre treatment is not economical as the cost would be approximately $30.00 per acre.

Conclusions

Absinthe is a difficult to control weed. None of the pre-seed burnoff treatments resulted in adequate control. Prestige provided satisfactory in-crop control, but the presence of fall re-growth suggests that control will not be long-term. Amitrol 240 did not provide control of absinthe economically.

F. Indication for further development

Future studies will have to look at integration of a number of control strategies to control the weed. This study indicates the lack of a "one-shot" control option for absinthe. Future work on the biology of absinthe may provide some insight into possible control strategies.

Table 1: Effect of pre-seeding herbicides on control of absinthe (% visual top growth control), Rockhaven, 2002.

Treatment	Rate	% Control 25-May-02	% Control 21-Jun-02
1 Vantage Plus (glyphosate)	0.5 liter/acre	0	0
2 Vantage Plus (glyphosate)	1.0 liter/acre	10	30
3 Pre-Pass (florasulam + glyhosate)	0.5 + 0.04 liter /acre	25	30
4 Pre-Pass (florasulam + glyphosate)	1.0 + 0.08 liter/acre	20	25
5 Vantage Plus + Express	0.5 liter + 4 g/acre	5	25
6 Vantage Plus + Express	1.0 liter + 4 g/acre	20	40
7 Vantage Plus + Banvel (+ Agral 90)	0.5 + 0.12 liter/acre	5	30
8 Amitrol-T	1.7 liter/acre	45	35
9 Untreated		0	0

Table 2: Effect of post-emergence broadleaf herbicides on control of absinthe in durum wheat, Rockhaven, 2002.

	Treatment	Product Rate liters/acre	% Control 04-Jul-02	% Control 08-Aug-02
1	Frontline-D (florasulam + 2,4 D Ester)	0.04 + 0.32	78	53
2	2,4 D Ester 700	0.32	41	47
3	2,4 D Ester 700	0.64	59	53
4	Spectrum (florasulam + Curtail-M)	0.04 + 0.6	79	62
5	Attain (fluroxypyr + 2,4-D LV ester)	0.24 + 0.40	79	60
6	Prestige (fluroxypyr + Curtail-M)	0.32 + 0.8	87	80
7	Dyvel	0.5	54	53
8	Untreated		0	0

A. Flax Varieties for Organic Farming Production

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and

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A. Abstract/Executive Summary

The objective of this experiment was to see if early flowering in flax could be combined with late, after tillage, seeding for weed control in organic production. Nineteen experimental flax lines, along with 5 check varieties, were seeded at two seeding dates, May 10 and June 4 at the Scott Experimental Farm. The severe drought experienced in 2002 masked any differences among entries in this experiment. Yields were only 10% of normal and no significant differences were found among entries or seeding time. However, the oil content, protein content and iodine value of the experimental lines were normal. Seed increase of all 19 lines was successful in preparation for future experiments.

Technical Report

As described in application 20010055, nineteen crosses were made at the Crop Development Centre during the early winter of 1999-2000 among early flowering varieties identified in the Plant Gene Resources of Canada collection, early maturing Canadian selections and standard flax varieties. The F1's were raised in the College of Agriculture Phytotron during the spring of 2000 and the 19 F2 populations sown in June at the Kernen Farm Crop Research Farm. Early flowering selections were made from each population and these selections were grown at the Kernen Farm during the summer of 2001. As proposed early flowering selections were made from each population and the seed of these selections, along with the varieties CDC Bethune, CDC Arras and AC Watson, were increased at the Ceres Research Farm of Pyne Gould Guinness in Christchurch, New Zealand during the winter of 2001-2002. These plots were harvested and approximately 1 kg of seed of each was returned to the CDC in April of 2002.

The trial grown at the Scott Experimental Farm was a split-plot design with 4 replicates. The main plots were dates and the sub-plots were lines/varieties. The planting dates were May 10 and June 4. In addition to the lines/varieties listed above, Vimy and CDC Normandy were added to the experiment, making a total of 24 lines/varieties. Other than pre-seeding tillage no weed control was used on the experiment. The drought of 2002 had a profound effect on this test and even the weeds did not establish or grow well. Emergence of all plots was normal but the drought masked any real differences among lines in time to flower by forcing lines to flower early. The highest average yield was only 206 kg/ha (Table 1). This is around 10% of a normal yield for flax at Scott. The coefficient of variation for yield was very high (32%), making the data very unreliable. There was really no difference in yield between the May 10 and June 4 seeding dates (Table 2). A few lines like entries 13 and 16 do seem to perform better at the later date.

All 24 entries were increased in 18 m^2 plots at the Kernen Crop Research Farm. These plots were harvested (Table 3) and will provide seed for experiments in 2003. Quality analysis was also performed on this seed and had that for oil, iodine value and protein. The 19 experimental lines were all within the range of standard Canadian varieties.

Therefore, in conclusion, the results for 2002 were very disappointing but they will provide some guidance for choosing which experimental lines should be used in future experiments involving this material. The fact that the experimental lines are within the normal quality range is encouraging.

Table 1. Average yield of the 24 flax entries at Scott SK in 2002

Entry	Line	Yield (kg/ha)
1	98EMS1403//CDC Normandy/92F54593	154
2	98EMS1403//FP961/F91109	156
3	98EMS1403//DEU2879	153
4	98EMS1403//CZE2927	154
5	CDC Normandy/92F54593//DEU2879	163
6	CDC Normandy/92F54593//CZE	160
7	FP961/F91109//DEU2879	171
8	FP961/F91109//CZE2927	195
9	CDC Arras/FP1048	181
10	CDC Arras/FP2004	145
11	CDC Valour/FP2004	175
12	CDC Valour/FP2041	178
13	FP1048/FP1050	201
14	FP1048/FP2041	150
15	FP1048/FP1077	206
16	CDC Bethune/FP1077	201
17	CDC Bethune/FP2041	165
18	CDC Arras/FP1077	174
19	FP1048/FP2004	171
20	CDC Bethune	155
21	CDC Arras	139
22	AC Watrous	149
23	Vimy	158
24	CDC Normandy	150

Table 2. Average yield for the two planting dates of the 24 flax entries at Scott SK in 2002

Entry	Line	Yield (kg/ha) May 10	June 4
1	98EMS1403//CDC Normandy/92F54593	168	140
2	98EMS1403//FP961/F91109	153	160
3	98EMS1403//DEU2879	148	158
4	98EMS1403//CZE2927	163	145
5	CDC Normandy/92F54593//DEU2879	178	148
6	CDC Normandy/92F54593//CZE	168	153
7	FP961/F91109//DEU2879	173	170
8	FP961/F91109//CZE2927	180	210
9	CDC Arras/FP1048	178	185
10	CDC Arras/FP2004	180	110
11	CDC Valour/FP2004	165	185
12	CDC Valour/FP2041	178	178
13	FP1048/FP1050	173	230
14	FP1048/FP2041	163	138
15	FP1048/FP1077	205	208
16	CDC Bethune/FP1077	183	220
17	CDC Bethune/FP2041	158	173
18	CDC Arras/FP1077	173	175
19	FP1048/FP2004	175	168
20	CDC Bethune	168	143
21	CDC Arras	135	143
22	AC Watrous	150	148
23	Vimy	155	160
24	CDC Normandy	150	150

Table 3. The total seed yield from increase plots of the 24 lines/varieties grown at Saskatoon in 2002 and the quality analysis of the seed.

Entry	Line	Yield (gms)	Oil (%)	Iodine value	Protein (%)
1	98EMS1403//CDC Normandy/92F54593	865	43.0	186	25.4
2	98EMS1403//FP961/F91109	1645	41.9	182	25.3
3	98EMS1403//DEU2879	1173	40.1	188	25.5
4	98EMS1403//CZE2927	1318	41.3	192	25.2
5	CDC Normandy/92F54593//DEU2879	723	40.8	189	24.9
6	CDC Normandy/92F54593//CZE	1152	40.4	189	24.5
7	FP961/F91109//DEU2879	990	42.7	188	25.6
8	FP961/F91109//CZE2927	1192	40.1	188	25.6
9	CDC Arras/FP1048	942	41.3	187	25.0
10	CDC Arras/FP2004	1129	42.7	191	25.4
11	CDC Valour/FP2004	1147	41.4	189	25.1
12	CDC Valour/FP2041	970	42.0	185	25.4
13	FP1048/FP1050	1227	42.1	186	24.4
14	FP1048/FP2041	1446	43.3	187	24.4
15	FP1048/FP1077	1466	41.8	187	24.7
16	CDC Bethune/FP1077	1704	41.7	185	24.5
17	CDC Bethune/FP2041	1510	42.1	188	24.0
18	CDC Arras/FP1077	1258	43.1	190	23.8
19	FP1048/FP2004	848	41.4	189	23.9
20	CDC Bethune	1183	41.8	185	24.7
21	CDC Arras	781	42.8	188	24.5
22	AC Watrous	1165	43.0	188	25.0
23	Vimy	1366	42.0	190	24.8
24	CDC Normandy	1043	40.4	185	25.2

A. Effect of Flea Beetle Damage To Canola as Influenced by Seed Treatment and Canola Type

S. M. Phelps[1], E. Johnson[2], and H. Schell[2]
[1]SAFRR, [2]AAFC

B. Summary

Two hybrid varieties, SW001 and Invigor 2663, were compared to the conventional varieties of Quantum and Excel in terms of their ability to withstand flea beetle damage. Untreated seed was compared to fungicide treated (Vitavax RS® + Apron FL®) and to insecticide treated (Helix®) seed. Results prove that treating seed with insecticide is important for flea beetle protection. Seeding date it also important in terms of impact on levels of flea beetle damage. Early May seeded canola had higher damage ratings than canola seeded in late May. There is no variety impact on ability to withstand flea beetle damage and the hybrids were just as affected as the open pollinated varieties.

C. Background and Objectives of Study

With the development of larger seeded, more vigorous hybrid canola varieties there is more healthy vigorous seedlings. These seedlings are able to germinate quicker and produce healthier more robust plants quicker than open pollinated varieties. Seed treatments have been used extensively to help open pollinated varieties withstand insect and disease pressure. The effectiveness of the seed treatments on the new hybrid varieties has yet to be determined. With cash flow for farmers being tight this year many questions are arising about importance and value of seed treatments with hybrid canola. In particular, the increased vigor and growth rate of the hybrids may help these cultivars to withstand insect damage, such as flea beetles, without insecticide applications. The hybrids reach the 2 leaf stage much quicker than the open pollinated varieties and once at this stage the tolerance to flea beetle damage is much greater. The objective of this study was to evaluate whether the hybrid cultivars are more tolerant to flea beetle damage than the open pollinated varieties and to determine the importance of insecticides for flea beetle protection.

D. Study Description

Materials and Methods

The study was conducted at the Scott Experimental Farm on a dark brown chernozemic loam soil during 2002. The canola varieties were direct seeded into summerfallow on May 10 and May 20 using a cone seeder. Fertilizer was banded at a rate of 40 lbs of 11-51-0 blend.

Untreated seed samples of the hybrid cultivars Invigor 2663 and SW 5001, as well as the open pollinated cultivars Quantum and AC Exel were taken to Canadian Seed Coaters in

North Battleford where applications of seed treatments were performed. Seed treatments were Vitavax RS plus Apron, and Helix. 1000 kernel weights were calculated for each treatment and seeding rate was targeted at 150 plants per square metre. The trial consisted of a randomized complete block design with 12 treatments. There were 4 replicates and the plot size was 1m x 10m.

Data collection involved visual ratings at cotyledon stage and was based on percent of cotyledon area damaged by flea beetles. Ten plants were selected systematically and a number is given for each cotyledon for a total of 20 estimates per plot. No damage to the cotyledons rates a zero and complete cotyledon removal or death rates a 10. Means are calculated per plot and multiplied by 100 to give percent damage.

E. Results and Discussion

With the dry conditions this spring the emergence of all canola varieties was variable and both seeding dates emerged at the same time. The emergence was variable as some seed did germinate from the soil moisture present at seeding but majority of emergence occurred after the first rain in early June. The first ratings were taken on June 7th and the second on June 14th. A third rating was taken on June 18th for the May 20th seeding date only as the May 10th seeding date was beyond the cotyledon stage. Table 1 shows the results of individual ratings and shows that there were significant differences in cotyledon damage caused by flea beetles, depending on the treatment.

Table 1. Visual ratings of percent cotyledon damage caused by flea beetles.

Canola Variety	Seed Treatment	May 10th Seeding Date				May 20th Seeding Date				
		7-Jun	14-Jun	Average		7-Jun	14-Jun	18-Jun	Average	
		% damage to cotyledons								
Invigor 2663	Bare	88.3	89.8	89.0	*b*	50.3	84.8	56.9	64.9	*c*
	Vitavax RS®/ApronFL®	88.8	95.2	92.0	*b*	24.3	80.2	50.0	51.4	*b* *c*
	Helix®	31.5	42.8	37.1	*a*	3.0	30.5	9.5	14.2	*a*
SW 5001	Bare	89.1	97.0	93.0	*b*	40.3	87.8	48.4	58.8	*b* *c*
	Vitavax RS®/ApronFL®	86.0	90.7	88.4	*b*	54.3	91.0	41.9	62.2	*b* *c*
	Helix®	50.3	54.0	52.0	*a*	6.1	26.5	19.1	17.2	*a*
AC Excel	Bare	85.0	91.5	88.4	*b*	26.5	86.5	39.9	50.9	*b* *c*
	Vitavax RS®/ApronFL®	71.0	100	85.5	*b*	16.2	84.3	49.5	50	*b*
	Helix®	45.3	47.2	46.2	*a*	14.9	20.2	7.3	14	*a*
Quantu	Bare	94.3	100	97.1	*b*	22.1	83.5	63.1	56.2	*b*

m										
										c
	Vitavax RS®/ApronFL®	91.9	97.0	94.4	*b*	40.5	71.8	53.3	55	*b* *c*
	Helix®	31.9	47.5	39.5	*a*	3.5	25.0	14.9	14.4	*a*
LSD (p<0.05)		*27.7*	*28.5*	*28.5*		*30.2*	*15.9*	*21.3*	*14.2*	

When visual ratings are averaged by seeding date there appears to be a seeding date effect on percent flea beetle damage to cotyledons. The earlier seeded canola had more flea beetle damage than later seeded canola over all varieties and seed treatments. The May 10th seeding date had an average of 75% damage whereas the May 20th seeding date had only 45% damage over all treatments and rating dates.

Flea beetle infestation was very high during the rating period. Table 2 shows the results from each rating. There were no differences between cultivars of canola with all ratings except on June 14th with the May 20th seeded canola the variety SW 5001 did have more flea beetle damage than Quantum. Due to no consistency with other ratings this is not considered to be a true variety effect but rather an artifact of the experiment.

Table 2. Flea beetle damage ratings by variety.

	May 10th Seeding Date			May 20th Seeding Date			
Canola Variety	7-Jun	14-Jun	Average	7-Jun	14-Jun	18-Jun	Average
	% damage to cotyledons						
Invigor 2663	69.5 *a*	75.9 *a*	72.9 *a*	26.0 *a*	65.0 *ab*	38.8 *a*	43.4 *ab*
SW5001	75.1 *a*	80.6 *a*	78.0 *a*	33.8 *a*	68.2 *b*	36.5 *a*	46.3 *b*
AC Excel	67.1 *a*	79.6 *a*	73.4 *a*	19.3 *a*	63.5 *ab*	32.2 *a*	38.3 *a*
Quantum	72.7 *a*	81.5 *a*	77.0 *a*	22.2 *a*	59.9 *a*	43.8 *a*	42 *a*
LSD (p<0.05)	*15.0*	*11.9*	*12.2*	*15.7*	*14.2*	*7.4*	*7.4*

Flea beetle damage was significantly affected by seed treatment (Table 3). Where no insecticide was used, the bare and Vitavax® treatments, there was significantly more damage than where Helix® was used in all varieties and all seeding dates.

Table 3. Effect of seed treatment on flea beetle damage.

	May 10th Seeding Date						May 20th Seeding Date							
Seed	7-Jun		14-Jun		Average		7-Jun		14-Jun		18-Jun		Average	
Treatment	*% damage to cotyledons*													
Bare	89.1	*b*	94.6	*b*	91.9	*b*	34.9	*b*	85.5	*b*	52.1	*b*	57.6	*b*
Vitavax RS® and Apron FL®	84.4	*b*	95.7	*b*	90.1	*b*	34.0	*b*	81.6	*b*	48.7	*b*	54.8	*b*
Helix®	39.7	*a*	47.9	*a*	43.7	*a*	7.0	*a*	25.3	*a*	12.7	*a*	15.1	*a*
LSD ($p<0.05$)	*13.8*		*16.8*		*14.2*		*15.1*		*7.9*		*10.7*		*7.1*	

F. Conclusions

Treating seed with insecticide is important for flea beetle protection. Seeding date does also have an impact on levels of flea beetle damage. Earlier seeded canola had higher damage ratings than the later seeded canola. There is no variety impact on ability to withstand flea beetle damage and the hybrids were just as affected as the open pollinated varieties. The fungicide treatments show no advantage over bare seed in 2002 due to low disease pressure.

G. Indication for Further Development

This study provided results demonstrating the importance of insecticide in providing flea beetle protection to canola. Further studies looking at other insecticides in combination with different seed sizes and seedling vigor under better soil moisture than obtained in 2002 should be undertaken.

Vitavax RS® and Apron FL® seed treatments are registered trademarks of Gustafson
Helix® seed treatment is a registered trademark of Syngenta.

A. Organic Production Research - Integration of Mechanical Weed Management

E.N. Johnson, Scott Research Farm, 2002

B. Summary

Combinations of pre-emergence rod-weeding, post-emergence cross-harrowing (0, 1, and 2 passes) and inter-row cultivation (0, 1, and 2 passes) were evaluated in peas to determine the best mechanical weed management practices for organic producers. Drought and an early fall frost caused severe crop damage so seed yields could not be taken. The highest crop response (field pea fresh weight) was recorded with pre-emergence rod-weeding. Cross-harrowing may have caused some crop injury as evidenced by a reduction in fresh weight. All mechanical treatments resulted in similar reductions in weed density and fresh weight. Controlling early weed flushes prior to crop emergence with minimal crop damage are benefits of pre-emergence rod-weeding that should be considered by organic growers. With late weed flushes, post-emergence cross-harrowing and inter-row cultivation are two options that work well.

C. Background and Objectives of Study

Non-chemical alternatives to weed control requires some form of tillage. There are a number of different tillage practices that could be used to manage weeds when field pea is grown organically. However, little is known regarding the independent and combined effects of these tillage practices. Therefore, an experiment was conducted to evaluate pre- and post-emergence mechanical weed control treatments in field pea.

D. Study Description

Materials and Methods

The study was conducted on tilled fallow that received a single early spring cultivation. Wild oat (*Avena fatua* L.) and wild mustard (*Sinapis arvensis* L.) were seeded simultaneously across the plots on May 4th at a target density of 100 plants m^{-2}. A shallow cultivation was done immediately after weed seeding to uniformly distribute the weed seeds. Seeding was delayed for a month due to the severe drought conditions. Pea (cv. Grande) was seeded at a rate of 220 kg ha^{-1} (80 viable seeds m^{-2}) with a hoe drill equipped with a 34 cm row spacing and on-row packing. Field pea was seeded on June 13 at a depth of 7.5 cm with 5.6 kg ha^{-1} of granular inoculant applied in the seed row. The experiment was conducted according to a split-split plot design with pre-emergence tillage (rod-weed: yes or no) as the main plot factor, cross-harrowing (0, 1, and 2 passes) as the subplot factor, and inter-row cultivation (0, 1, and 2 times) as the sub-subplot factor. Treatments were replicated four times. The sub-subplot size was 2 m by 4 m.

The pre-emergence tillage treatments were conducted just prior to field pea emergence and consisted of two passes with a rod-weeder operating at about a 2.5 cm depth. The cross-harrowing treatment included a tine harrow operation at five miles per hour with the tines angled 10° back when field pea rows were just visible. Inter-row tillage was

done at a depth of 2.5 to 3.0 cm with a cultivator modified to fit between crop rows. The different amounts of inter-row cultivation were achieved by adding operations at progressively later growth stages of field pea: 6 to 7 nodes and 8 to 10 nodes. A herbicide check, which included a post-emergence application of imazamox at 30 g ai ha^{-1} at the 4–5 node stage of field pea was also included.

Data collected included weed and field pea plant densities and fresh weights. Frost injury on Aug. 2, 2002 caused severe damage so seed yield was not taken. However, crop biomass (fresh weight) near crop maturity provides an indication of yield advantages and the weed control benefits. Data analysis was conducted according to the experimental design. Data from the herbicide check plots were not included in the statistical analysis.

E. Results and Discussion

See results in Tables 1, and 2.

Mechanical treatments resulted in field pea densities similar to the untreated check but slightly lower than the herbicide check (Table 1). As in previous years, the greatest increase in field pea fresh weight was provided by pre-emergence rod-weeding. Pre-emergence rod-weeding increased field pea biomass by 69%. Although yields were not obtained, increase in biomass has correlated well with seed yield increase in most years. Cross-harrowing resulted in a decrease in field pea biomass indicating that the harrowing may have caused crop injury. Inter-row cultivation increased field pea biomass by 16 to 23%.

Pre-emergence rod-weeding, cross harrowing, and inter-row cultivation each resulted in approximately 40% reduction in weed density and weed fresh weight. The combination of pre-emergence rod-weeding, cross harrowing, and inter-row cultivation reduced weed densities and fresh weight further to 9 plants m^{-2} and 109 g m^{-2}, respectively (data not shown). This was about a 94% reduction in weed density and fresh weight relative to the untreated check. Mechanical weed control was superior to the herbicide in reducing weed density and weed biomass in 2002. This was due to the failure of the herbicide under the extreme drought conditions.

There were some significant interactions between factors; however, considering the environment and variability of the data, it is of limited value to discuss them in an annual report.

F. Conclusions

As in previous years, the largest crop response to mechanical weed control was from pre-emergence rod-weeding. This is likely due to a high degree of crop-weed selectivity and the fact that very little crop injury occurs when pre-emergence rod-weeding is conducted. Pre-emergence rod-weeding, cross-harrowing, and inter-row cultivation each resulted in similar reductions in weed interference. If weeds are present between the time of seeding and crop emergence, growers should definitely control these weeds with a shallow tillage

implement. If weeds emerge after crop emergence, then post-emergence harrowing or inter-row cultivation can be conducted.

Table 1. Pea Data

Weed Control	*Pea Data*	
	Density plant m^{-2}	Fresh Weight g m^{-2}
No Rodweed	66	493.6
Rodweed	57	832.9
LSD	11	222.9
No Cross-harrow	68	787.4
1 Cross-harrow	61	535.7
2 Cross-harrow	55	666.6
LSD	10.7	428.3
No Inter-row cultivation	62	584.8
1 Inter-row cultivation	63	681.6
2 Inter-row cultivation	58	723.3
LSD	7.0	81.4
Herbicide Check	75	673.5

Table 2: Weed Data

Weed Control	Weed Data	
	Density plants m^{-2}	Fresh Weight g m^{-2}
No Rodweed	72	454.9
Rodweed	27	285.3
LSD	11.4	63
No Cross-harrow	71	583.3
1 Cross-harrow	45	276.2
2 Cross-harrow	32	250.8
LSD	24	149.4
No Inter-row cultivation	69	464.8
1 Inter-row cultivation	46	348.2
2 Inter-row cultivation	33	297.3
LSD	11.2	90.5
Herbicide Check	88	328.5

G. Indication for further development

This study provided results similar to previous related studies. An additional year of study is required in order to draw valid conclusions.

A. Optimizing lentil seeding rate in the absence of herbicides

Eric Johnson, AAFC Scott Research Farm

B. Summary

Lentils (cv. CDC Glamis) were seeded at eleven seeding rates ranging from 13 to 278 kg ha^{-1} in the presence and absence of chemical weed control. The seeding rates that resulted in the lowest weed biomass when no herbicides were applied were in the range of 130 to 150 kg ha^{-1}. There was no relationship between seeding rate and weed biomass when herbicides were applied.

C. Background and Objectives of Study

Preliminary work under the SPOKE special crop program suggested that to maximize production of organically grown lentil, growers should seed the crops in narrow rows at 0.5 to 2.0 times the recommended seed rate used for conventional production. Conventional seed rates for lentils are 80 to 100 kg ha^{-1} for large seeded lentils and 40 to 50 kg ha^{-1} for small seeded lentil. The use of narrow row spacings and higher seeding rates are often considered by farmers attempting to minimize the negative effects of uncontrolled weeds. Lentil is among the least competitive crops that are grown by organic producers on the Canadian prairies. The objective of this study was to validate previous research by evaluating a wide range lentil seeding rates to determine the rate that will optimize yield and minimize weed interference.

D. Study Description

Materials and Methods

Eleven rates of lentils were seeded randomly in a 2-factor split-block design. The blocks received either a weed control treatment (split application of Sencor 500 and Select at rates of 0.172 and 0.08 liter/acre, respectively) or no weed control. CDC Glamis lentil was seeded in 11 cm rows at rates ranging from 13 to 278 kg ha^{-1}. The treatments were seeded directly into canola stubble with a hoe-drill on May 10, 2002. Treatments were only replicated twice due to the wide range of seeding rates employed in the experiment.

The plots were infested with natural populations of volunteer canola, shepherd's-purse, common lambs-quarters, wild oat, and green foxtail. Data collection included lentil plant numbers, weed numbers by species, total weed fresh weight, and crop fresh weight. Drought and early August frost caused significant crop damage so seed yield was not obtained.

E. Results and Discussion

In spite of the drought conditions, seeding rate had a significant effect on weed biomass when there was no herbicide applied (Figure 1). Weed fresh weight declined as seeding rate increased to about 130 to 150 kg ha^{-1}. There was a slight increase in weed fresh weight as seed rates increased beyond 200 kg ha^{-1}. These results support earlier studies conducted at Scott that suggest that organic growers should consider increasing their lentil seeding rate by 1.5 to 2.0 times that recommended for conventional production. When herbicides were applied, there was no relationship between seed rate and weed biomass (data not shown). In the absence of herbicides, increased seed rate resulted in a linear increase in crop biomass (Figure 2). As with weed biomass, there was no relationship between seeding rate and lentil biomass when herbicides were applied.

F. Conclusions

The results from this study support earlier studies conducted at Scott that suggest that organic growers should consider increasing their lentil seeding rate by 1.5 to 2.0 times that recommended for conventional production.

G. Indication for further development

The study should be continued for a few more years to validate an optimum seeding rate for lentil when grown in the absence of herbicides. This will also allow for an economic evaluation of the data.

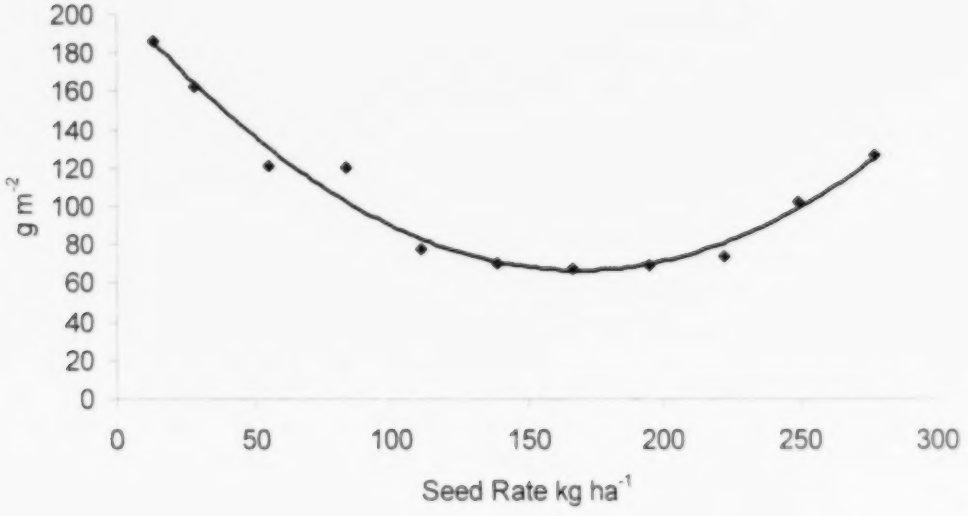

Figure 1: Effect of lentil seed rate on total weed fresh weight (g m^{-2}) with no herbicides applied. Scott, 2002.

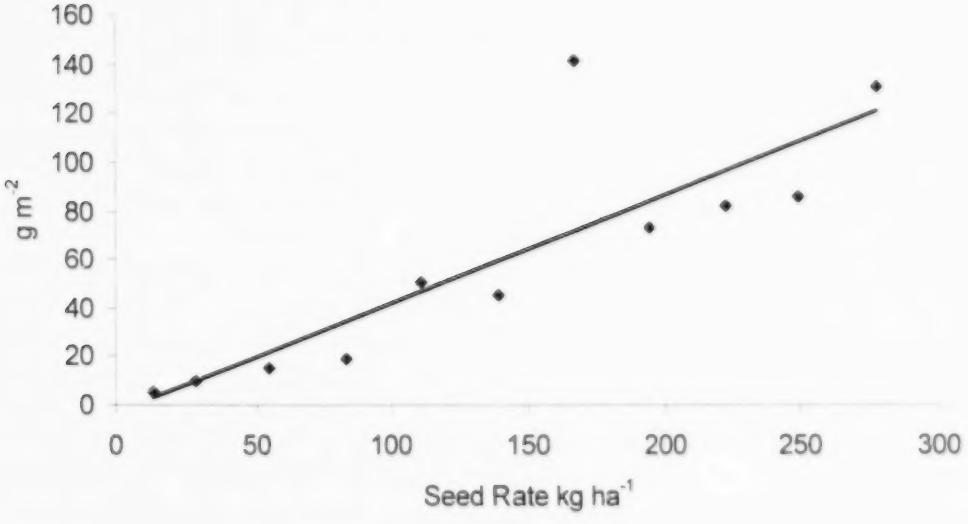

Figure 2: Effect of lentil seed rate on lentil biomass (g m^{-2}) with no herbicides applied. Scott, 2002.

A. Optimizing Crop Yield through timeliness of Weed Removal with Low Drift Sprays

Eric N. Johnson and T.M. Wolf, Agriculture and Agri-Food Canada

B. Summary

Herbicide performance and crop yield was assessed in crops with differing competitive ability. Herbicide sprays were applied in a timely manner (i.e., early), and under less optimal timing (about 10 days later) using a range of spray qualities.

C. Background and Objectives of Study

The time of weed removal is known to be of key importance in optimizing high cereal, pulse, and oilseed yields in Saskatchewan. Implementing timely weed removal can be hampered by unfavourable weather conditions such as high winds, which cause significant delays in the application of herbicides. Low-drift sprays can be applied in a timely fashion under windier conditions, but efficacy is a concern, particularly with competitive grassy weeds. It is unknown whether the advantage of timely weed removal is offset by the disadvantage of reduced product efficacy.

The objective of this project is to develop practical information on the relative importance of timely weed removal compared to the efficacy of coarser sprays. It is hypothesized that the lower efficacy with a coarse spray is more than compensated by the advantage of timelier removal that is facilitated by this technology.

D. Study Description

Materials and Methods

Barley (*cv.* Merit), *B. napus* canola and flax (*cv.* Norlin) were seeded on May 13, 2002. Poor canola emergence necessitated the reseeding of the plots to *B. rapa* canola (*cv.* 41P55) on June 10. Each crop was seeded as a separate experiment.
Crops were seeded on fallow using a hoe-press drill with a 21 cm row spacing.

Each crop was treated with a registered Group 1 graminicide tank-mixed with an appropriate broadleaf herbicide. The herbicides applied to each crop are listed in Table 1.

Treatment design was factorial with a randomized complete block design. Factors included nozzle type (fine, medium, and coarse droplet size) and timing of application (7 and 17 days after emergence (DAE)). Application was made with an air-delivered shrouded bicycle sprayer calibrated to apply a carrier volume of 110 l ha^{-1}. Details on nozzle types are outlined in Table 1.

The study relied on natural weed seed bank populations. Visual crop injury symptoms and weed control ratings were taken in the flax plots with the TeeJet XR 8001 applied 7

days after emergence as the check. With the barley and canola experiments there were no crop injury ratings as there was no visible injury symptoms as a result of herbicide application. Also, the dry conditions resulted in poor weed emergence, therefore weed control ratings could not be conducted for these two crops.

The drought was severe and crop yields were low. Barley, canola, and flax were harvested on August 23, Sept. 9, and Sept. 19, respectively.

Table 1: Crops, herbicide rates, nozzle type, and timing of application used in study. Scott, 2002.

Crops	Herbicide/ Rate (g ai ha^{-1})	Nozzles	Volume Median Diameter	Timing
Barley *Good competitor*	Achieve / 200 Buctril M / 560	TeeJet XR8001 Air Mix 11001 TurboDrop XL 101/TT11002	150 250 400	7 DAE 17 DAE
Canola *Medium Competitor*	Select / 47 Muster / 22	TeeJet XR8001 Air Mix 11001 TurboDrop XL 101/TT11002	150 250 400	7 DAE 17 DAE
Flax *Poor competitor*	Select / 47 Buctril M / 560	TeeJet XR8001 Air Mix 11001 TurboDrop XL 101/TT11002	150 250 400	7 DAE 17 DAE

E. Results and Discussion

Results are presented in Tables 2 to 6.

There was no effect of nozzle type or time of application on the yield of barley or canola in 2002 (Table 2 and 3). This is likely due to the low levels of weed emergence resulting in low levels of weed interference.

The AirMix and Turbodrop nozzles resulted in slightly more crop injury than the TeeJet, particularly at the early application date (Table 4). Subsequent studies will investigate whether this is consistent over years.

All nozzles resulted in excellent control of green foxtail, wild buckwheat and prostrate knotweed in the flax trial (Table 5). Control was consistent over both early and late timings. Previous experiments on timing of herbicide application typically show that weed control is maintained when application is delayed; however, crop yields are typically lower due to the longer duration of weed interference. Weed control with the

AirMix nozzle was slightly higher than the other nozzles, but all nozzles resulted in satisfactory control.

Flax yields were very low with about 3 bushels/acre on average (Table 6). The AirMix nozzle provided a significant yield increase in flax over the TeeJet, but it was less than 1 bushel/acre. Application timing had no effect on flax yield.

F. Conclusions

Very few conclusions should be drawn from this experiment due to the severe drought. Under severe drought conditions, nozzle type and timing of herbicide application had little effect on crop yield and weed control.

Table 2: Effect of nozzle type and time of spraying on yield of barley (kg ha^{-1})

	Barley yield (kg ha^{-1})		
	Time of Spraying		
Nozzle	7 DAE	17DAE	Mean
Tee Jet XR 8001	1055	1008	1031
AirMix 11001	1075	1078	1076
Turbodrop XL 11001	1073	1120	1096
Mean	1068	1068	

LSD for Nozzle – 84.7
LSD for Timing - 69.2
No nozzle X timing interaction (p = 0.51)

Table 3: Effect of nozzle type and time of spraying on yield of canola (kg ha^{-1})

	Canola yield (kg ha^{-1})		
	Time of Spraying		
Nozzle	7 DAE	17DAE	Mean
Tee Jet XR 8001	575	533	554
AirMix 11001	655	538	596
Turbodrop XL 11001	613	615	614
Mean	614	562	

LSD for Nozzle – 136.3
LSD for Timing - 111.3
No nozzle X timing interaction (p = 0.64)

Table 4: Effect of nozzle type and time of spraying on % crop injury in flax. Ratings conducted 10 days after application.

	% injury

Nozzle	Time of Spraying 7 DAE	17DAE	Mean
Tee Jet XR 8001	0.1	8.8	4.5
AirMix 11001	12.5	9	10.8
Turbodrop XL 11001	12.5	13	12.8
Mean	8.4	10.3	

Table 5: Effect of nozzle type and time of spraying on % control of green foxtail, wild buckwheat, and prostrate knotweed in flax. Ratings conducted on July 23.

Nozzle	Green Foxtail			Wild Buckwheat			Prostrate Knotweed		
	7 DAE	17DAE	Mean	7 DAE	17DAE	Mean	7 DAE	17DAE	Mean
Tee Jet XR 8001	93	96	95	92	100	96	66	91	79
AirMix 11001	99	100	100	90	100	95	89	74	82
Turbodrop XL 11001	90	96	93	88	95	92	78	74	76
Mean	94	97		90	98		78	80	

Table 6: Effect of nozzle type and time of spraying on yield of flax (kg ha^{-1})

Nozzle	Flax yield (kg ha^{-1}) Time of Spraying 7 DAE	17DAE	Mean
Tee Jet XR 8001	185	170	178
AirMix 11001	185	230	208
Turbodrop XL 11001	170	178	174
Mean	180	193	

LSD for Nozzle – 30.8
LSD for Timing - 25.2
No nozzle X timing interaction ($p = 0.14$)

G. Indication for further development

The experiment will be repeated in 2003 with modifications. Weeds (wild oat and wild mustard) will be seeded between rows and untreated checks will be included. The experiment will be designed to include the 3 crops in the factorial design in order to statistically determine whether there is an interaction of timing and/ or spray quality with crops of differing competitive ability. An additional, very late timing may be added as well.

A. Turnips – For Forage in NW Saskatchewan

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L. P. Nielsen, AAFC

B. Summary

The purpose of this demonstration was to evaluate the suitability of turnips as a forage for livestock production in NW Saskatchewan. The demonstration was set up at Scott and Loon Lake, SK in 2002. Turnip seed was obtained from Priarie Seeds and was seeded adjacent to the annual forage trials. The turnips survived the early August frosts and produced dry matter comparable to the top producing forages in the annual forage trial. Dry matter yields averaged 3168 and 2534 kg/ha for above and below ground material, respectively. The combined dry matter weight of 5702 kg/ha was greater than any of the annual forages in the trial adjacent. The above ground parts of the plant had a moisture content of 80% at harvest and protein levels at 20.2%. The below ground parts of the turnips had higher moisture at 84% and lower protein at 17%. The digestibility of the turnips tops was high for both tops and bottoms as the RFV values were 407 and 351, respectively. The high digestibility, high protein and good forage yields of the turnips suggest turnips could be suitable forage for Western Canada.

C. Background and Objectives

Brassica species have been long known for their use as forage crops in much of the world. Turnips, rutabagas, rape, kale and Swedes are examples of commonly used forage brassicas. The high quality, high yielding, fast growing characteristics of brassicas are particularly suitable for grazing by livestock. The exceptionally high digestibility (often 85-90%) is also appealing to livestock producers. The short-season root brassicas such as rutabagas and turnips provide roots, stem and leaf growth for grazing and have good tolerance to frost. Top growth generally will survive temperatures between 15-20 degrees F, while bulbs will be about 5 degrees hardier. The protein levels from production in the United States range from 17-24% for tops and 12-15% for roots. The high digestibility and good protein levels coupled with adaptability of canola and mustard to Western Canada suggest that brassicas as a forage crop may be vital to the forage and livestock industry. The objective of this demonstration was to have an initial look at the adaptability of turnips to production as a forage in NW Saskatchewan.

D. Study Description

Materials and Methods

The demonstration consisted of growing 4 plots of turnips beside the annual forage trial at Scott and Loon Lake on May 18th and May 17th, respectively. The turnips were direct seeded into wheat stubble using a cone seeder at a seeding rate of 4 lbs per acre. Data collection consisted of wet and dry weights of above and below ground portions of the

plants at the time that the cool season cereals were at the early dough stage. The dried material was ground and a sample submitted to EnviroTest labs for forage analysis.

E. Results and Discussion

At both locations drought was a factor in 2002. Emergence of the turnips was slow and variable. Frost in August did reduce the growth of the turnips in Scott. The yields produced are shown in table 1. Turnips averaged 32,000 kilograms of plant material per hectare. Once the material is allowed to dry the amount per hectare decreases substantially to 5700 kilograms.

Table 1. Wet and dry weight results from turnip plots in 2002 at specified locations

	Loon Lake	Scott	Average
WET WEIGHTS	Kg/ha	Kg/ha	Kg/ha
Tops	19991	12865	16428
Tubers	19164	13600	16382
Tops & Tubers	39155	26465	32810
DRY WEIGHTS			
Tops	3559	2778	3168
Tubers	2908	2160	2534
Tops & Tubers	6467	4938	5702

Comparing the turnip yields to other forages harvested at the same time from the adjacent annual forage trial shows the comparative dry matter production (Figure 1). The dry matter yield of turnip tops is comparable to the yields obtained with barley and oats from both locations. When the turnip tubers are combined with the tops the total biomass obtained out yields all other forages at both locations.

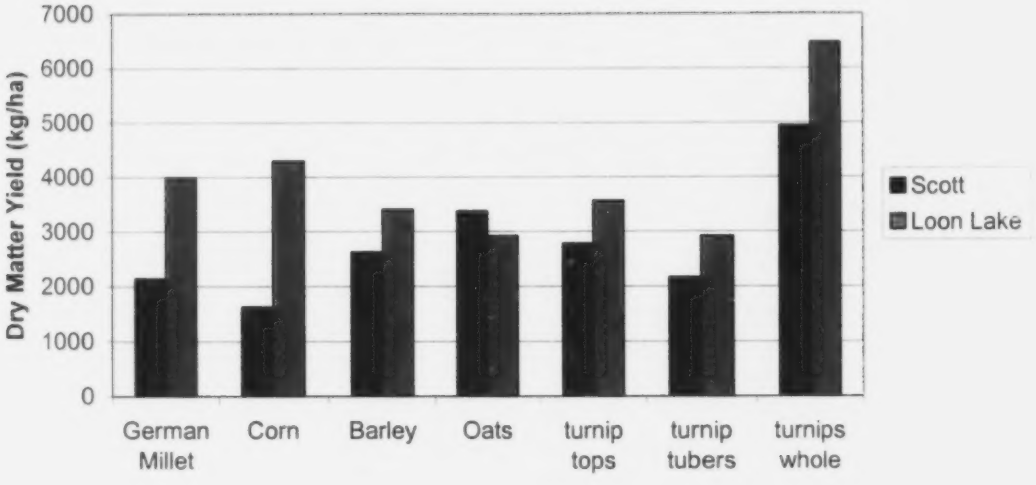

Figure 1. Dry matter yields of various annual forages.

Forage analysis of turnips in comparison to the other forages shows the high RFV and TDN which supports high digestibility and great feed value (Table 2). The protein levels are also very appealing at 17.2 to 20% for bottoms and tops of the turnips, respectively.

Table 2. Forage anlaysis of turnips compared to corn, german millet, oat and barley from adjacent trial.

Crop	Moisture (%)	Protein(%)	RFV (%)	TDN (%)
Turnip – tops	80	20.2	407	83
Turnip – bottom	84	17.2	351	78
Corn	74	12.4	124	70
German Millet	70	12.8	111	68
Oats	53	12.5	126	68
Barley	46	12.6	142	74

F. Conclusions

Turnips are an appealing alternative for grazing in terms of the amount of forage produced, the digestibility, protein and feed values. The demonstrations in 2002 gave a glimpse of how turnips are adapted to conditions in NW Saskatchewan but further research is needed to truly evaluate their productivity, regrowth potential, and use as grazing alternative.

G. Indication For Further Development

More research is needed into using brassica crops as forage for livestock in Saskatchewan. Turnip yield and quality in 2002 are an indication of potential for use.

Further studies are needed to address areas such as growth rates, response to grazing, production optimization and intercropping options, where little information is available for Saskatchewan production.

Scott Research Farm Field Days 2002

Organic Field Day

An organic field day was scheduled for July 23, 2002. It was decided that the field day should be cancelled due to the severe drought. In spite of the cancellation, seven organic growers had up at the Scott Research Farm on the afternoon of July 23 and were given an impromptu tour of the research. The growers were shown plots demonstrating control of wild oat and green foxtail with biocontrol agents developed at the Saskatoon Research Center. Following that they were shown research in progress on mechanical weed control, phosphate fertilization alternatives for organic production, a long-term alternative cropping study, and studies on green manure crops. Also, a demonstration of post-emergence weed control in field pea using a rotary harrow was conducted. Feedback from the growers indicated that the field day should not have been cancelled even though the plots were ravaged by drought as the information obtained was very valuable.

Lashburn Tour

Forty producers attended the Lashburn tour, which was held on July 24, 2002. Producers were given a tour of cereal, pulse, and oilseed cultivars that are being evaluated at the Lashburn Project Farm, a satellite site of the Scott Research Farm. In addition, presentations were made on weed control in droughty conditions, maintenance of surface residues, potential insect problems, water development programs and alternative feed supplies for livestock.

Loon Lake Tour

On July 25th a field tour was held at the Loon Lake Project Farm, another satellite site of the Scott Research Farm. There were ten producers in attendance at the evening tour which consisted of annual and perennial forage variety trials; cereal, oilseed, and pulse varieties; hog manure application and management; and fall seeded canola. Discussions revolved mainly around forages and production for livestock as this is a livestock producing area.

Scott Research Farm Field Day

With 239 people in attendance on July 10th there was good discussions and many questions. It was a great learning environment for everyone. During lunch the announcement of AFIF contribution to Pulse Field Lab was announced by Honourable Ralph Goodale and Gord Nystuen. Research and demonstrations covered during the whole day tour included fertilizer management for high yielding canola, fertilizer

application methods after seeding, protein concentrations in wheat as influenced by zero versus conventional tillage, canola and field pea frequency in rotations and the importance of disease control, influence of seed size and seed vigour on canola establishment, and cultivar and variety development in cereals, oilseeds and pulses. In the area of weed control, there were many interesting and informative sessions including biological control of wild oat and green foxtail, sprayer technology, minor use herbicide research, efficacy of herbicides as influenced by rates and water volumes, and herbicide residue symptoms. Also included in the tour was an insect update and disease update. The Scott Research Farm is one of the seven locations in Saskatchewan that is part of the producer-driven applied research program known as AgriARM. Included in this program are over 15 projects that are being studied at Scott. Five of these projects were shown at the field day and include annual forage trial, double cropping of annual forages with canola and wheat, inoculant application methods, flea beetle control in canola, and minor use herbicides.

Wheatland Conservation Area Inc.
Swift Current

Bryan Nybo - Manager

Wheatland Conservation Area (WCA) was established in 1983 by producers concerned about soil degradation, with a special emphasis on soil salinity. WCA is an incorporated, not-for-profit organization with several sites located throughout the Brown soil zone of southwest Saskatchewan. WCA has a long standing agreement with AAFC for office space in their facility at Swift Current (SPARC). The WCA storage building is also on the Swift Current Research Farm. WCA participated in the previous SPOKE program, conducted direct seeding and special crop projects.

Wheatland Conservation Area's mission is to research applied science and demonstrate special crops technology to producers in the Brown Soil Zone of southwest Saskatchewan, and to advance the adaptation of special crops into extended rotations, thereby improving producer's economic returns and long term sustainability of the operation and the environment.

A. Cereal response to nitrogen on pulse and cereal stubbles.

B. Summary
With the move towards direct seeding on the prairies, producers have been diversifying into many different crops for additional rotational options. Since cereal crops will always dominate acres on the prairies, it is important to know how they interact with other crops in a rotation. The purpose of this study was to evaluate cereal responses to nitrogen on various crop stubbles. Varying levels of nitrogen (30, 45, and 70 lbs/ac were conducted on seven different stubbles. (chickpea, pea, lentil, fenugreek, durum, oriental mustard, coriander). The trail was conducted in Swift Current in the summer of 2002. Increased levels of nitrogen increased crop yield on all stubble-types. Pulse stubbles also increase yield in durum and barley production.

C. Background and objectives of study
With producers extending rotations and including pulses and other crops into their operation, more thought must be put into planning rotations and seeding intentions. Disease, weed, and pest cycle along with nutrient management, soil conservation, equipment capabilities and other logistics must be considered. The objective of this study is to evaluate cereal response to increasing rates of nitrogen on various stubble types to maximize yield, quality, and profit.

D. Study description
The study was conducted at Swift Current, Saskatchewan in the 2002 crop year. The trial consisted of seven stubbles (chickpea, pea, lentil, fenugreek, durum, oriental mustard, coriander)
and was replicated three times. Kyle durum was seeded at 80 lbs/ac, and Harrington barley was seeded at 80 lbs/ac into the seven different stubbles with three different rates of nitrogen. The three different rates of actual nitrogen are, high rate 70 lbs/ac, medium rate 45 lbs/ac, low rate 30 lbs/ac. The 45 lbs/ac rate is the soil test recommended level. The crop was seeded using a Flexi-Coil 5000 air drill with double shoot stealth openers. The fertilizer was placed down the point of the openers. The main study parameters were grain yield and protein.

E. Results and conclusions
This report will focus on crop yield, since proteins have not yet been processed. Swift Current received above average rainfall for 2002, therefore both durum and barley responded favourably to the increasing rates of nitrogen. In all stubbles, both durum and barley had a significant yield advantage to increasing rates of nitrogen. In addition, using higher levels of nitrogen on pulse stubbles seems to have greater benefit than using extra fertilizer on cereal stubbles. This may be the indirect result of a break in disease, weed, and pest cycles. In years where moisture is a limiting factor, crops may respond differently. Both the durum and barley crops responded best to chickpea stubble. Again, this may not be the case in years where moisture is a limiting factor since chickpeas have been known to be relatively high users of water. In general both durum and barley reacted favourably to pulse stubbles when compared to cereal stubbles as they were able to take an indirect advantage of the nitrogen fixing benefits of the previous year's pulse.

As well, breaking disease, weed, and other pest cycles can benefit yield and quality. These benefits occurred at all rates of nitrogen.

Table 1. Swift Current mean data 2002

Crop	Durum Bu/Ac	Crop	Barley Bu/Ac
chickpea	18.80 a	chickpea	19.33 a
coriander	16.92 b	durum	18.32 ab
pea	15.74 c	fenugreek	18.07 abc
lentil	15.31 c	pea	17.94 bc
mustard	15.16 c	lentil	17.79 bc
fenugreek	12.27 d	coriander	16.65 c
durum	10.60 e	mustard	14.93 d

Table 2. Swift Current mean data 2002

Crop	Fertilizer	Stubble	Bu/Ac	Crop	Fertilizer	Stubble	Bu/Ac
durum	high	pulse	18.28 a	barley	high	durum	21.72 a
durum	low	pulse	15.95 b	barley	high	pulse	20.80 a
durum	medium	pulse	15.61 b	barley	medium	durum	18.30 b
durum	high	durum	11.28 c	barley	medium	pulse	17.36 bc
durum	medium	durum	10.38 d	barley	low	pulse	16.89 c
durum	low	durum	10.15 d	barley	low	durum	14.29 d

F. Indication for further development

The results indicate that use of high levels of nitrogen, and planting cereals on pulse stubbles give a significant yield advantage. Unfortunately this is only a two year rotation. The long term rotation benefits in a pulse stubble are not realized. Further study into the role of pulses in rotation and the amount of nitrogen needed to maximize yield are still needed.

G. Information on performance indicators

Pulses have become a major player in Saskatchewan agriculture. Due to rotation requirements it is necessary to grow cereals in a rotation. This research aids the producer in determining the amount of nitrogen needed to maximize production in the cereal year of their rotation. As well,

this data will assist producers with planning rotations and seeding intentions. The agronomic information gleaned from this study will enable the producer to maximize economic benefits from their cropping rotation.

A. Chickpea Seeding Date Trials

B. Summary

Chickpeas have become a significant cash crop in south west Saskatchewan. Associated with this, are high input costs. Proper agronomics, therefore, are vital to its continued success. Seeding date is one of the most important agronomic decisions facing a chickpea grower. Chickpeas are late maturing, so the risk of frost before harvest is a concern. Area producers, therefore, are inclined to seed as early as possible. Early seeded crops, however, are vulnerable to frost damage after emergence. This study looks into finding the optimum seeding date for chickpeas using an air delivery system.

Two chickpea varieties were studied, Sanford (kabuli) and a Desiray (desi). The three seeding dates were May 3(early), May 13 (mid), and May 21 (late). Their was no significant yield differences in kabuli and desi chickpeas for all seeding dates. The 2002 growing season was wet and cool. Moisture was not limiting and the crop flowered for a longer period than average. There was no killing frost early in the growing season and harvest was grossly delayed resulting in a common harvest date for all treatments. These factors may be the reason we see vary little yield differences. Plant establishment was the same for all seeding dates, and seeding date did not seem to affect the health of the plants. Disease was not a factor in this study and the seeding date did not change the amount or severity of disease. These results are based on one site year of data and may not reflect long term results. In other years, seeding in mid May will reduce many of the risks involved in seeding kabuli and desi chickpeas.

C. Background and objectives of study

In the past, the majority of producers seeded chickpeas in the middle of May. Early fall frost created severe down grading in some of these years. As a result, chickpea growers moved to earlier seeding dates to the point where early spring frost becomes a potential factor. Unlike previous seeding date work, this test was seeded using an air delivery system, which is by far the most common seeding tool used by producers. The results, therefore, may not reflect those done in the past using a cone seeder. Factor such as seed impact and seed coat damage from an air delivery system may affect early seeding of kabuli chickpeas when seeded into cold soils. The desi type chickpea, having a much tougher seed coat, is less likely to experience damage. The focus of this project is to determine if there is any yield advantage to seeding early. From this, producers can determine if this yield advantage, if any, is worth the increased risks associated with seeding early. As well, we looked at how seeding dates affect days to maturity and recognized the risks associated with a delayed harvest.

D. Study description

The plots were seeded using a Flexi-coil 5000 air drill with knife openers, replicated 3 times. We compared the desi and kabuli types of chickpeas treated with Crown and Apron. The seed was planted, early May, mid May and late May. The crop was treated as a producer grown crop with respect to weed, pest, and disease control etc..
Crops: Sanford kabuli chickpea, Desiray desi chickpea
Dates of Seeding: May 3, May 13, May 21

Seeding Rate: Sanford 130 lbs/ac, Desiray 100 lbs/ac
Fertilizer: 11-51-0 @ 50 lbs/ac, Inoculant:Tag Team Granular @ 5 lbs/ac
Seed Treatment: Crown and Apron at recommenced rates (Sanfords only)
Harvesting: The crops were combined at maturity utilizing the Wintersteiger plot combine.
Data Collected: Days to emergence, Days to flower, Days to maturity, Plants/square meter, Yield, 1000 seed weight, % green seed if applicable.

E: Results and Conclusions:
In 2002, there were no significant yield differences in kabuli and desi chickpeas for all seeding dates. The 2002 growing season was wet and cool. Moisture was not limiting and the crop flowered for a longer period than average. There was no killing frost early in the growing season and harvest was delayed resulting in a common harvest date for all treatments. These factors may be the reason we see little yield differences.

Treatment	Yield (kg/ha)	Treatment	Yield (kg/ha)
Sanford mid	1642 a	Desiray late	2392 a
Sanford early	1459 a	Desiray mid	2379 a
Sanford late	1358 a	Desiray early	2243 a

Plant establishment was the same for all seeding dates, and seeding date did not seem to affect the health of the plants. Disease was not factor in this study and the seeding date did not change the amount or severity of disease. These results are based on one site year of data and may not reflect long term results. In other years, seeding in mid May will reduce many of the risks involved in seeding kabuli and desi chickpeas.

G. Indication for Further Development:
This study looks at the comparison between kabuli and desi chickpeas on different seeding dates using an air delivery system. Since kabuli type chickpeas are more sensitive to seed coat damage than desi types, and there was a significant difference in yield between the early and the mid seeded kabuli and no significant yield difference between early and mid seeded
desi type, we must determine if this is due to seed coat damage or inherent varietal differences. Seeding date trials of kabuli and desi type chickpeas comparing air delivery systems and low impact cone seeders would be relevant.

A. Lowering Cost of Chickpea Production

B. Summary

The purpose of this study was to examine different ways for producers to lower the cost of chickpea production. The trial was conducted at Swift Current, Sask. in 2002 using Sanford chickpeas. We examined four different avenues to lowering the cost of chickpea production. Various combinations of seeding rates, fertilizer rates, row spacing, and fungicides were targeted for lower production costs. The results had that conventionally registered products outperformed unregistered products for ascochtya control. Additional fertilizer boosted yields and the 130 lbs/ac seeding rate maximized production. Nine inch row spacing tends to increase production as compared to 18 inch spacing. The wet growing season made the spread of disease very easy and allowed the plant to use the high rate of fertilizer to its greatest potential.

C. Background and objectives of study

Producers in Southwest Saskatchewan have been growing chickpeas for a number of years with great financial success. In many cases this has gave farmers the economic boost needed to make their operation viable. With the advancement of ascochyta, and lower chickpea prices, producers are losing this economic edge. In order to regain this advantage, producers must be able to adequately manage their ascochyta and at the same time reduce the cost of production associated with this crop. We examined four different avenues to lowering the cost of chickpea production. Various combinations of seeding rates, fertilizer rates, row spacing, and fungicides were targeted for lower production costs. The variables that were studied in this trial are all changes that any producer can easily adapt to their equipment.

D. Study description

The study was conducted at Swift Current, Sask. in the 2002 crop year. A randomized complete design (RCBD) with three replicates was used. Sanford chickpea, an ascochyta susceptible variety, was studied. Three different seeding variables were studied: seeding rate 130 and 100 lbs/ac, fertilizer rate 11-51-0 at 50, 25, and 0 lbs/ac, row spacing 9 and 18 inch. These variables were used in combination to make twelve treatments. These treatments were sprayed with four different fungicides: conventional(Bravo, Quadris, Quadris, Bravo), Dithane (4 applications), sulphur (4 applications), copper (4 applications). The crop was seeded into durum stubble using a Flexi-Coil 5000 air drill with double shoot stealth openers.

E. Results and conclusions

The use of any fungicide, other than the conventional registered fungicides, proved to be disastrous. Disease pressure in 2002 was too great for the non-registered fungicide used in the study. Due to this disaster, all data reported from this point will be taken from treatments within the conventional fungicide plots only. The conventional plots in this study were sprayed four times in the following sequence: Bravo, Quadris, Quadris, Bravo.

Table 1: Crop Yields (all treatments) by fungicide

Fungicide	Yield (kg/ha)
Conventional	908 a
Dithane	220 b
sulphur	126 c
copper	106 c

Fertilizer rate also had large yield responses. In general the higher rate of fertilizer translated to larger yields. In 2002, moisture was not a limiting factor which may have influenced yield responses from fertilizer. Drier years may show different results.

Fertilizer Rate (11-51-0) (lbs/ac)	Yield (kg/ha)
50	1069 a
25	836 b
0	818 b

The nine inch row spacing shows a yield advantage over eighteen inch row spacing. By using granular inoculant and inoculating the soil, only half the amount of granular inoculate is used with the 18 inch row spacing, thus cutting the inoculant bill in half. Another advantage of the larger row spacing is plant height. These plants were 2-3 inches taller which would make combining less difficult. Even though there are certain insignificant advantages to the large row spacing, it is not enough to offset yield losses.

Row Spacing	Yield (kg/ha)
9"	988 a
18"	827 b

We also looked at the interaction between row spacings and seeding rate. A significant yield advantage was seen with the 9 inch row spacing at the 130 lb/ac seeding rate. If we look only at the 18 inch row spacing, there was no significant yield advantage between seeding rates, although as previously mentioned, both were lower than the 9 inch treatments. The money a producer would save from going to a wide seed row or cutting rates, would not cover the lose a producer would incur from the resulting yield loss.

Row Spacing X Seeding Rate	Yield (kg/ha)
9" X 130 lbs/ac	1113 a
9" X 100 lbs/ac	864 b
18" X 130 lbs/ac	842 b
18" X 100 lbs/ac	812 b

Since fungicides are the greatest input cost, resistant chickpea varieties should be looked at in this study. It is conceivable that a resistant variety, on a wider row spacing, at a lower seeding rate, may require fewer fungicide applications, resulting in savings to growers.

In 2002, we see that the recommended seeding rate with a healthy fertilizer program will help to ensure the start of a good crop. After the crop is established a healthy maintenance program of traditional fungicides is needed to ensure the crop is a success.

F. Indication for further development

The past year was a year of extremes, moisture and disease pressure are a few elements that had major effects on the test. More data years must be obtained to determine recommendations on fertilizer rates, row spacing, and seeding rates. The use of unregistered fungicides is definitely not advised on susceptible varieties. More work must be done with more resistant chickpea varieties and looking at time of spraying and sequencing of various registered fungicides.

G. Information on performance indicators

Chickpeas are in danger of becoming a "flash in the pan" crop for Saskatchewan. Due to bad experiences caused by high disease pressure, the use of susceptible varieties, and in a few instances, poor management, chickpea acres will decline in 2003. With increased agronomic work on this crop, the producer will be able to successfully grow chickpeas for less dollars than previous years. By lowering the cost of production of chickpeas, and properly controlling ascochyta, producers will be able to use chickpeas as another tool when diversifying their farming operation. This research aides to address the need for agronomic information needed to produce a cost effective crop.

A. Forage Establishment on Saline Affected Land

B. Summary

Soils affected by high levels of salinity are nonproductive as well as environmentally and aesthetically hazardous. These areas are expanding which is cause for concern to producers and land managers. The purpose of the study was to demonstrate and evaluate how four different forage mixtures establish and develop on moderate to severe salinity affected land. The trail was conducted in 2002 five miles northwest of Swift Current. The grass was seeded successfully in the spring of 2002. In the 2003 crop year it will be determined which crops establish themselves successfully on varying degrees of salinity. Also, we will evaluate the longevity of each stand and determine which varieties remain in a stand and which varieties disappear.

C. Background and objectives of study

Soil salinity has long been a thorn in the side of producers in the brown soil zone. Land that is not productive is costly and has a negative economic impact on producers. Establishing vegetative growth in these areas is difficult and frustrating. Forages are one crop that can tolerates salinity to produce a crop that is marketable. The objective of this study is to showcase forage varieties that establish well in salt affected soils. Also, we will evaluate the longevity of each stand and determine which varieties remain in a stand and which varieties disappear

D. Study Description

The study was planted at Swift Current, Saskatchewan in the 2002 cropping year. A randomized complete block design (RCBD) with four replicates and four treatments were studied. The treatments were seed at 14 lbs/ac and consisted of: Mixture 1 - Crested wheat grass 4 lbs/ac, Russian wild rye grass 4 lbs/ac, Tall wheat grass 4 lbs/ac, alfalfa 2 lbs/ac; Mixture 2 - Smooth brome grass 4 lbs/ac, Slender wheat grass 4 lbs/ac, Russian wild rye grass 4 lbs/ac, alfalfa 2 lbs/ac; Mixture 3 - Dahurian wild rye grass 4 lbs/ac, Intermediate wheat grass 4 lbs/ac, Meadow brome grass 4 lbs/ac, alfalfa 2 lbs/ac; Mixture 4 - Garrison creeping foxtail 2 lbs/ac, Courtney tall fescue 6 lbs/ac, Altai wild rye grass 4 lbs/ac, alfalfa 2 lbs/ac. The plots had a preseed burnoff with Roundup Transorb at 0.5 l/ac. The treatments are sown into a area of low salinity at the beginning of the plot. The level of the salinity increases throughout the plot to an extreme salinity level. The parameters measured are plant establishment at different salinity levels, and plant yield.

E. Results and conclusions

2002 was an excellent year for forage establishment. Above average rainfall gave the forage seed ample chance to germinate and grow. Initial indications look promising for overall good germination. The next several years will indicate as to how well the various mixture perform under varying levels of salinity. Also, we will evaluate the longevity of each stand and which varieties remain in a stand and which varieties disappear.

F. Indication on further development

Continued species evaluation under field scale conditions, as well as longevity of established stands and rejuvenation techniques should be developed. Native grass species are all the rage in forage production. Seeding native grasses is problem in all soils and even worse in salinity affected soil. Additional work with native grass species and forage mixtures on salinity would help producers return land to it's original state.

G. Information on performance indicators

Returning waste land back into a production should be a priority for producers and the province. This land can be productively used for forage production to help feed the expanding livestock herd in the province. Returning salinity land to grass is also environmentally friendly and good for wildlife and our environment.

A. Green fallow, Annual Forage, or Seed Production

B. Summary

The objective of this study is to compare different annual forages and their resulting yields and protein, and to show the difference in a recrop year between a crop that is green fallowed, harvested for forage, or harvested for seed. With several different avenues to explore after seeding a crop, a producer is not locked into a predetermined end use. As environmental conditions and markets change a grower has the freedom to adapt to optimize the value of the crop.

C. Background and objectives of study

The cowherd in Saskatchewan is rumoured to triple in size in the next ten years. A safe reliable feed source will be needed for this to happen. The use of annual forages will definitely play a major role in helping to feed the increased cattle herd. Producers would like to see the performance of different annual forage crops under field scale conditions to determine which would fit best into their operation. The use of a legume as green fallow will also help producers' rotations and enable them to lower input costs. The objective of this study is to compare different annual forages and their resulting yields and protein, and to show the difference in a recrop year between a crop that is green fallowed, harvested for forage, or harvested for seed. We also hope to form an equation that will enable producers to estimate grain yield from forage matter in order to determine if a crop should be harvested for forage, seed, or green manure. With several different avenues to explore after seeding a crop, a producer is not locked into a predetermined end use. As environmental conditions and markets change a grower has the freedom to adapt to optimize the value of the crop.

D. Study description

The study was conducted in Swift Current in 2002. A randomized complete block design replicated three times was used consisting of 13 forage treatments, 5 green manure treatments, and 8 treatments harvested for seed as follows:

Harvested for forage: (using a motting machine)
Grande pea, 40-10 silage pea, Greenfix, Faba bean, Millet, Forage oat, Forage barley, Triticale, 40-10 silage pea and forage oat, 40-10 silage pea and barley, 40-10 silage pea and triticale, Forage corn, Carneval and alfalfa .

Terminating as green manure: (glyphosate)
Grande pea, 40-10 silage pea, Greenfix, Faba bean, Chem fallow (check).

Harvested for seed: (using the plot harvester)
Grande pea, 40-10 silage pea, Greenfix, Millet, Forage oats, Forage barley, Triticale, Faba bean.

All treatments will be recropped the following year to durum.

Data collected: Biomass yield, biomass protein, seed yield, seed protein, recrop seed yield, recrop seed protein, residual soil N, soil moisture.

E. Results and conclusions

Data collected to date include biomass yield and seed yield. Protein data should be available later this winter and recropping information will be taken next season. Fall soil moistures were taken and will be related to next years recrop data. No data was taken from the green manure plots other than the termination date. In 2002 this occurred on July 15 th.

Crop Harvested for Forage	kg/ha	% Soil H2O in Fall
German Golden Millet	7821 a	20.65
Fatima Faba bean	7323 b	18.75
Forage corn	7259 b	21.18
Grande Pea	2648 c	19.71
40-10 Silage Pea	2397 cd	20.72
Sandro Triticale	2389 cd	19.72
Mustang Forage oat	2296 d	20.74
Carneval-alfalfa	2226 d	19.00
Virden Forage barley	2188 de	21.52
40-10 barley	2187 de	21.19
40-10 oat	1897 ef	17.28
40-10 trit	1893 ef	20.81
AC Greenfix	1735 f	17.64

Crop Harvested for Seed	kg/ha	% Soil H2O in Fall	Ratio of Seed yield to Forage Yield 2002
Mustang Forage oats	3977 a	19.90	1.73
Grande Pea	3376 b	19.85	1.28
AC Greenfix	2669 c	16.64	1.54
40-10 Silage Pea	2506 c	20.57	1.05
Sandro Triticale	2246 d	20.98	0.94
Virden Forage barley	2155 de	21.52	0.98
Fatima Faba bean	1959 e	17.74	0.27
German Golden Millet	518 f	17.49	0.066

Crop Terminated for Greenfallow	% Soil H2O in Fall
40-10 Silage Pea	21.30
Chem Fallow (Check)	19.39
Fatima Faba bean	21.04
Grande Pea	19.99
AC Greenfix	20.82

We also looked at the ratio of seed yield to forage yield in attempts to form an equation that will enable producers to estimate grain yield from forage matter. Producers can then estimate which end use has greatest value and can determine if a crop should be harvested for forage, seed, or green manure.

F. Indication for further development

To date we have shown grain yields and dry matter biomass yields from some annual forages.

As this project continues we will take a further look at feed quality as well as the yield and quality of a cereal recrop.

G. Information on performance indicators

When producers have different end use options from a crop, they possess the ability to maximize value from that crop and can minimize overall risk. As markets and weather patterns change producers are able to take advantage of these options to improve their bottom line.

A. Greenfallow termination for fertilization

B. Summary

The purpose of the study is to evaluate various green manure crops in a rotation and the resulting impact on the following cereal recrop. The trial was conducted in 2002 at Swift Current, Saskatchewan. Durum will be recropped on the green fallow plots in the 2003 crop year. The green manure crops were terminated at early flower at left untouched for the remainder of the growing season.

C. Background and objectives of study

Limited amount of work on green manure at a field scale level has been done in the brown soil zone. Fertilizer prices have increased steadily over the past years and producers are looking for a economical way to enhance fertility levels on their farm. The shift towards direct seeding and continuous cropping has increased interest in the use of green manure. The use of green manure allows the producer to manage weeds, save moisture as compared to growing a full season crop, and lower input costs for the next year. The objective of the study is to evaluate various green manure crops in a rotation and the resulting impact on the following cereal recrop.

D. Study description

The study was conducted at Swift Current Saskatchewan in the 2002 cropping year. A randomized complete block design (RCBD) with three replicates consisting of five treatments:
40-10 silage pea, grande pea, Ac Greenfix, faba bean, and chemical fallow. The treatments were direct seeded into durum stubble using a Flexi-Coil 5000 air drill with double shoot stealth openers. The treatments were inoculated with self-stick inoculant at recommended rates. No fertilizer was applied to the plots. The chem fallow was sprayed throughout the year as needed. The four seeded treatments were terminated at early flower with 1 l/ac of Roundup Transorb (glyphosate). Soil samples will be taken in the fall of 2002 to determine soil moisture and nutrient availability. In 2003 the plots will recropped to durum and the resulting yield and protein will be calculated to determine the benefits of green manure.

E. Results and conclusions

The greenfallow was successfully terminated. Soil test information will be available in the winter of 2002. Durum yields and protein will be available in the fall of 2003.

F. Indication for further development

A green fallow crop can be a valuable tool for producers to include in a rotation. Reducing summer fallow acres and lowering input costs are benefits realized by a green fallow operation. Evaluating crops for green manuring under a variety of growing conditions will be required.

G. Information on performance indicators

Long term environmentally friendly agriculture practise are vital to the sustainability of Saskatchewan agriculture. Showcasing green manure on a field scale level allows producers to learn the benefits first hand. Producers who choose to green manure will improve their crop rotations and nutrient management program, while being good stewards of the land.

A. Inoculant Formulations and their Effect on Chickpea Yield

B. Summary

The purpose of the study was to evaluate the impact of different inoculant formulations, rates, and application techniques on chickpea yield. Trials were conducted at Swift Current and Frontier in the 2002 cropping year. At Swift Current, the liquid formulation in furrow had excellent potential with no significant difference from that of the highest yielding granular treatments. At Swift Current, the high rate of seed applied liquid inoculant had a yield advantage over the low rate of seed applied liquid. Both seed applied liquids at Swift Current were at the lower end of the scale, yet were significantly higher than the uninoculated check. The peat base powder formulation treatment had yields somewhere in the middle. At Frontier, conditions at seeding were drier and may have influenced results. At Frontier, the granular treatment had the highest yield; however, it had no significant difference from the peat based powder formulation. There was no significant difference between the three liquid formulation treatments although they were significantly higher than the uninoculated check.

C. Background and objectives of study

Inoculation has long been a key practice in the production of pulse crops. Producers are eager to learn how to maximize inoculation in field crops. Formulations, rates, and application techniques are all considerations made by producers to maximize efficiency of their inoculation. The objective of the study was to determine the efficacy rates of three commercially available products and determine the practicality of in furrow liquid application.

D. Study description

The study was conducted at two sites, Swift Current and Frontier, Saskatchewan in the 2002 crop year. A randomized complete block design (RCBD) with four replicates was used consisting of seven treatments: uninoculated check, Soil Implant granular low rate (1.4 oz./1000 ft), Soil Implant granular high rate (6 oz./1000 ft, Swift Current only), NitraStik-GC (70 oz,/1000 lbs), Cell-Tech in furrow (5 fl. oz./1000 ft), Cell-Tech low rate (2.5 fl. oz./ bu.), Cell-Tech high rate (3.75 fl. oz./bu.). The plots were seeded with a Flexi-Coil 5000 air drill using double shoot stealth openers. Sanford chickpeas were seeded at 130 lbs/ac on durum stubble at both locations. 11-51-0 was side banded at 50 lbs/ac at the same time as seeding. The Swift Current site received 20 inches of rain while the Frontier site received 24 inches. This was well above average and is not normal rainfall for either area. At Frontier, conditions at seeding were drier and may have influenced results. The Swift Current site is located two miles south of town and is a Haverhill clay loam type soil. The Frontier site is four mile west of town and is Echo clay loam type soil. Study parameters included: plant density, plant height, yield, 1000 seed weight.

E. Results and conclusions

At both sites we found that granular inoculant, despite the rate, displayed the highest yields. At Swift Current, the liquid formulation in furrow also had excellent potential with no significant difference from that of the highest yielding granular treatments.

Inoculating the soil instead of the seed promotes nodulation that translate into higher yields. At Swift Current, the high rate of seed applied liquid inoculant translated into a yield advantage compared to the low rate of seed applied liquid. Both seed applied liquids at Swift Current were at the lower end of the scale, yet were significantly higher than the uninoculated check. The peat base powder formulation treatment had yields somewhere in the middle. At Frontier, conditions at seeding were drier and may have influenced results. At Frontier, the granular treatment displayed the highest yield, however, it had no significant difference from the peat based powder formulation. There was no significant difference among the three liquid formulation treatments although they were significantly higher than the uninoculated check.

Granular inoculant performed very well at both locations. In furrow liquid inoculation also had it may have practical applications for the brown soil zone Self-stik powder proved to be a viable alternative to granular inoculant, generally yielding between granular and seed applied liquid inoculant at both locations.

When examining efficacy of inoculants we found in general increasing the amount of inoculant did not lead to significant yield advantages. This was the case in both the liquid and granular products. The only exception was the liquid inoculant at Swift Current where we observed a significant yield advantage when using the higher rate. This might be attributed to the fact that liquids tend to desiccate quicker when exposed to adverse environmental conditions.

Table 1. Chickpea Yields

Site	Treatment	Yield Bu/Ac	Site	Treatment	Yield Bu/Ac
Swift Current	Soil Implant granular low rate	22.80 a	Frontier	Soil Implant granular high rate	16.10 a
Swift Current	Soil Implant granular high rate	22.55 a	Frontier	Nitra-Stick GC powder	15.43 ab
Swift Current	Cell-Tech liquid in furrow	21.70 ab	Frontier	Cell-Tech liquid seed applied low rate	14.50 bc
Swift Current	Nitra-Stick GC powder	20.28 bc	Frontier	Cell-Tech liquid seed applied high rate	13.63 c
Swift Current	Cell-Tech liquid seed applied high rate	18.80 c	Frontier	Cell-Tech liquid in furrow	13.10 c
Swift Current	Cell-Tech liquid seed applied low rate	15.80 d	Frontier	uninoculated check	6.00 d

Swift Current	uninoculated check	11.93 e	Frontier		

F. Indication for further development

These results show great potential for in furrow applied liquid inoculants. This is only one years worth of data it would be necessary to see how different rates and techniques are affected under different growing conditions.

G. Information on performance indicators

Once proper efficacy of chickpea inoculants is established producers will be able to maximize their inoculant dollars. This will help them to producer a superior crop and help them to maximize returns for their operation. In addition, if in furrow liquid inoculants are effective, producers would have another option that may fit well in their inocualtion practice.

A. Pesticide Free Production Trial/Demonstration

B. Summary

The purpose of the study was to evaluate Pesticide Free Production (PFP) in the Brown Soil Zone and to demonstrate this practice to area producers. PFP is the practice of growing crops in the absence of in-crop applied pesticides. This differs from organic production in that producers can apply pre-seed burnoff and fertilizers. This study looks at the effects of eliminating in-crop herbicides and increased seeding rates on weed populations and crop yields. Producers can then determine if possible yield reductions from PFP are off set by potential market advantages for PFP grain. The trial was conducted in Swift Current in 2002 on land with relatively few weeds. The PFP treatments actually had a significant yield advantage in wheat and flax. The summer of 2002 was wet in Swift Current; therefore, soil moisture was not a limiting factor in this test. Eliminating in-crop herbicide did not show a yield reduction since the various crops did not have to compete for moisture. Each plot established well and rapidly closed off the crop canopy to later emerging weeds. This may not be the case in a drier year or a year where pre-seed burnoff is ineffective early in the growing season. It should also be noted that this is a one year scenario and practising PFP on the same land for consecutive years may lead to increased weed seed production and reductions in crop yield. Maintaining a strict weed control program before and after a PFP year would be necessary to make this practice sustainable.

C. Background and objectives of study

The use of pesticides in agriculture has been under the microscope in recent years with food safety being a major concern to consumers. It is not the objective of this project to determine the relationship, if any, that in-crop herbicides has on food safety. However, if this cropping system can satisfy existing or future markets, the agronomics and economics should be studied to give producers an advantage. The objective of this study is to determine if crops can be grown successfully (economically) in the absence of post-emergent pesticides. By increasing seeding rates, crop competition is used to minimize weed pressure. Wheatland Conservation Area is looking at how yield and weed control is affected by increased seeding rates in the absence of in-crop herbicide in the Brown Soil Zone. Extending these results to producers and demonstrating this cropping system in a field situation will allow producers to determine if PFP is a tool that can be incorporated into their operation.

D. Study Description

The study was conducted at Swift Current, Saskatchewan in the 2002 crop year. A randomized complete block design (RCBD) with four replicates was used consisting of six treatments: peas seeded at 180 and 220 lbs/ac, flax seeded at 45 and 56 lbs/ac, wheat seeded at 90 and 113 lbs/ac. The crop was seeded and fertilizer applied using a Flexi-Coil 5000 air drill using double shoot stealth openers. The wheat and flax received 60 lbs/ac of actual nitrogen and 20 lbs/ac of actual phosphorus. The peas received 5 lbs/ac of actual N and 20 lbs/ac of actual phosphorus. All treatments had a preseed burnoff with Roundup Transorb at 0.5 l/ac prior to seeding. The higher seeding rates received no additional weed control. The low seeding rate of peas and flax was sprayed with poast at .35 l/ac. The low seeding rate of wheat was sprayed with Achieve Extra Gold at recommended rates. Parameters measured on the crops were: plant density, plant height, and grain yield.

E. Results and conclusions

The PFP treatments actually had a significant yield advantage in wheat and flax. The summer of 2002 was wet in Swift Current; and soil moisture was not a limiting factor in this test. Moist conditions and low weed populations limited the positive effects of post-emergent herbicide applications. Each plot established well and rapidly closed off the crop canopy to later emerging weeds. This might not be the case in a drier year or a year where pre-seed burnoff is ineffective early in the growing season. It should be noted that this is a one year scenario and practising PFP on the same land for consecutive years may lead to increased weed seed production and reductions in crop yield. However, a PFP cropping system may fit well in the Dry Brown Soil zone where weed pressures are typically lower compared to other areas of the province. Maintaining a strict weed control program before and after a PFP year would be necessary to make this practice sustainable.

We would expect to see lower yields under a PFP cropping system in years where weed pressures are greater. If weeds are not controlled in years prior to a PFP year, or years where a preseed burnoff is ineffective, producers may experience a resulting yield loss. In this case, producers would require a premium on PFP grain to offset this yield loss.

Table 1. Swift Current Mean Data 2002

Crop & Seeding Rate Lbs/Ac	Yield Bu/Ac	Plant Density - Plants/M2
wheat 113	37.2 a	178 a
wheat 90	34.6 b	131 b
flax 56	27.7 a	354 a
flax 45	23.7 b	284 a
pea 220	54.5 a	85 a
pea 180	55.6 a	73 a

(significance indicated is within crop type)

F. Indication for further development

Based on one year of data, PFP production may be a short term viable option. The long term risk reward factors of this practise must be reviewed. Further research should be conducted to see how pesticide free production would fit into long term rotations. Recording weed populations and adding two treatments per crop (high seeding rate conventional and low seeding rate PFP) would be relevant to this test. Crops grown under a PFP cropping system will require a premium to ensure that PFP is sustainable practice.

G. Information on performance indicators

A Pesticide Free Production system offers opportunities to producers in areas where weed pressures are relatively low and weed populations are well managed. Price premiums on grain with a PFP label as well as additional market opportunities associated with the health food industry or the livestock feed industry are potential advantages to producers wishing to add value to their commodity.

A. Title: Regional Pulse Variety Trials at Swift Current, Frontier and Assiniboia

B. Summary:

Showcasing recently released pulse crop varieties under field scale conditions and providing producers with localized cropping information is an invaluable resource to producers. Yield, plant heights, days to flower, days to maturity, 1000 seed weights are all factors growers use when selecting varieties for their farm.

Large plot variety testing, using field scale equipment allows producers to accurately envision various crop characteristics in the field. Yield, standability, canopy uniformity and maturity; weed, disease, and pest infestations under large plot situations are more representative of a field situation. The plots were maintained to reflect that of a producer. Seeding, weed control, disease control, desiccation were all done with field scale equipment. Producers tend to be more confident with these results since they are applied from a producer perspective as opposed to a research perspective. The main drawback to large plots is the large volume of seed required to establish a plot. This becomes difficult when dealing with new varieties not yet commercially available, where seed availability is limited. Small plot research, however, has an infinite number of applications in areas of agronomics, breeding, and crop development and is an integral step to take before applied field scale testing can be done.

Testing was performed at three different sites in south west Saskatchewan, Swift Current, Frontier, and Assiniboia. Typically Frontier has an earlier, drier growing season with fewer growing degree days. Assiniboia tends to be wetter with the potential for high disease pressure. Typically, Swift Current is the latest of the three sites, wetter than Frontier, and less disease pressure than Assiniboia. In 2002, moisture was not a limiting factor at any of the three site, even though Frontier experienced early drought at seeding, which likely depressed yields in that area. Frontier received moisture later in the growing season in time to produce a crop, however, much of the total moisture fell in large quantities in a short period of time and contributed to the spread of ascochyta in chickpeas and other problems associated with flooding and water logging. In 2002, disease influenced the plots most at Frontier and least in Assiniboia.

In the large kabuli chickpea class, the improved genetics and the fern type leaf of the CDC Yuma variety had superior disease resistance and yield at all three sites. In the small kabuli class, CDC Chico did very well, showing significantly higher yields than all chickpea in all classes at Assiniboia, second highest in Frontier with no significant difference from the top yielding CDC Desiray variety, and third highest in Swift Current, behind CDC Anna and CDC Desiray. In the desi chickpea class, the CDC Desiray at Frontier had highest yields followed by CDC Nika and CDC Anna. In Swift Current, CDC Anna and CDC Desiray had significantly higher yields than CDC Nika. In Assiniboia, CDC Anna was significantly higher than CDC Desiray, which was significantly higher than CDC Nika.

In 2002, lentils followed no particular pattern throughout the three sites, with the exception of CDC Blaze being the lowest yielding lentil at all three sites. CDC Sedley

had a significant yield advantage in Assiniboia with CDC Redcap showing a significant yield advantage in Frontier. Yields were much tighter in Swift Current with 5 varieties showing no significant yield advantages.

As with most of the pulses, pea yields were highest in Assiniboia, down somewhat in Swift Current, and lowest in Frontier where early season moisture was severely limited. There were no significant yield advantages in the four peas tested in Frontier in 2002. The CDC Minuet was the highest yielding pea variety in both Swift Current and Assiniboia. Standability was a problem in the peas in 2002. All the varieties tested in 2002 layed down with the exception of the Eclipse, where lodging was not an issue.

C. Background and Objectives of Study:
Showcasing recently released pulse crop varieties under field scale conditions and providing producers with localized cropping information is an invaluable resource to producers. Yield, plant heights, days to flower, days to maturity, 1000 seed weights are all factors growers use when selecting varieties for their farm.

Large plot variety testing, using field scale equipment allows producers to accurately envision various crop characteristics in the field. Yield, standability, canopy uniformity and maturity; weed, disease, and pest infestations under large plot situations are more representative of a field situation. The plots were maintained to reflect that of a producer. Seeding, weed control, disease control, desiccation were all done with field scale equipment. Producers tend to be more confident with these results since they are applied from a producer perspective as opposed to a research perspective. The main drawback to large plots is the large volume of seed required to establish a plot. This becomes difficult when dealing with new varieties not yet commercially available, where seed availability is limited. Small plot research, however, has an infinite number of applications in areas of agronomics, breeding, and crop development and is an integral step to take before applied field scale testing can be done.

D. Study Description:
Location: Swift Current Agri-ARM site, Assiniboia, Frontier
Varieties:
Chickpeas: Sanford, CDC Yuma, CDC Xena, B-90, Chico, Myles, CDC Desiray, CDC Nika.
Peas: Delta, CDC Handel, CDC Minuet, Eclipse
Lentils: CDC Glamis, CDC Grandora, CDC Sovereign, CDC Redcap, CDC Robin, CDC Blaze, CDC Sedley.
Seeding:
The plots will be seeded in late April to early May using the Flexi-Coil 5000 air-drill with the double shoot stealth openers. 11-51-0 will be applied at a rate of 50 Lbs/Ac. The proper strain of granular inoculant was applied with the seed by utilizing the third tank. All crops will be seeded at recommended rates.
Chemical Control:

Swift Current and Assiniboia received a pre-seed burnoff with glyphosate. Frontier was treated with Edge. After emergence the crop was sprayed with Poast. The plots were monitored for disease and sprayed four times (Bravo, Quadris, Quadris, Bravo).
Plot Size: 16 feet X 100 feet - 3 reps
Data Collected: Yield, Plant Heights, Days to flower, Days to Maturity, 1000 seed Weights.

E. Results and Conclusion:
Testing was performed at three different sites in south west Saskatchewan, Swift Current, Frontier, and Assiniboia. Typically Frontier has an earlier, drier growing season with fewer growing degree days. Assiniboia tends to be wetter with the potential for high disease pressure. Typically, Swift Current is the latest of the three sites, wetter than Frontier, and less disease pressure than Assiniboia. In 2002, moisture was not a limiting factor at any of the three sites, even though Frontier experienced early drought at seeding, which likely depressed yields in that area. Frontier received moisture later in the growing season in time to produce a crop; however, much of the total moisture fell in large quantities in a short period of time and contributed to the spread of ascochyta in chickpeas and other problems associated with flooding and water logging. In 2002, disease influenced the plots most at Frontier and least in Assiniboia.

In the large kabuli chickpea class, the improved genetics and the fern type leaf of the CDC Yuma variety had superior disease resistance and yield at all three sites. In the small kabuli class, CDC Chico did very well, showing significantly higher yields than all chickpea in all classes at Assiniboia, second highest in Frontier with no significant difference from the top yielding CDC Desiray variety, and third highest in Swift Current, behind CDC Anna and CDC Desiray.

Variety	Swift Current Yield kg/ha	Assiniboia Yield kg/ha	Frontier kg/ha
CDC Chico	2842	3652	2359
B-90 (Amit)	2511	.	.
CDC Yuma	2061	2225	2036
CDC Xena	1583	1389	1243
Sanford	1526	2077	1020
CDC Diva	1500	1441	1253
LSD ($p<.05$)	68	148	162

In the desi chickpea class, the CDC Desiray at Frontier had highest yields followed by CDC Nika and CDC Anna. In Swift Current, CDC Anna and CDC Desiray had significantly higher yields than CDC Nika. In Assiniboia, CDC Anna was significantly higher than CDC Desiray, which was significantly higher than CDC Nika.

Variety	Swift Current Yield kg/ha	Assinibioa Yield kg/ha	Frontier kg/ha
CDC Anna	3074	3296	2094
CDC Desiray	3031	2859	2454
CDC Nika	2391	2670	2214
LSD ($p<.05$)			

In 2002, lentils followed no particular pattern throughout the three sites, with the exception of CDC Blaze being the lowest yielding lentil at all three sites. CDC Sedley had a significant yield advantage in Assiniboia with CDC Redcap showing a significant yield advantage in Frontier. Yields were much tighter in Swift Current with 5 varieties showing no significant yield advantages.

Variety	Swift Current Yield kg/ha	Assiniboia Yield kg/ha	Frontier kg/ha
CDC Sovereign	2375	2335	1280
CDC Grandora	2264	2157	1127
CDC Redcap	2227	2241	1636
CDC Glamis	2218	1862	1188
CDC Sedley	2164	2841	1302
CDC Robin	2107	2506	1363
CDC Blaze	1860	1819	846
LSD	220	213	189

As with most of the pulses, pea yields were highest in Assiniboia, down somewhat in Swift Current, and lowest in Frontier where early season moisture was severely limited. There were no significant yield advantages in the four peas tested in Frontier in 2002. The CDC Minuet was the highest yielding pea variety in both Swift Current and Assiniboia. Standability was a problem in the peas in 2002. All the varieties tested in 2002 layed down with the exception of the Eclipse, where lodging was not an issue.

Variety	Swift Current Yield kg/ha	Assiniboia Yield kg/ha	Frontier kg/ha
CDC Minuet	3838	4177	3282
Delta	3583	3912	3463
Eclipse	3379	4109	3489
CDC Handel	3117	3737	3303
LSD	192	226	261

F. Indication for Further Development:

The new varieties of pulses developed at the Crop Development Centre at Saskatoon have had a definite impact on the pulse industry in Saskatchewan. By showing the producer these crops in field like conditions and relating relevant and timely yield results we hope to increase adaptation of these new crops. As well, we feel that we can convince producers that are thinking of getting out of chickpeas to re-consider by using new ascochyta resistant varieties. As long as new varieties are being released we think it is important to display superior plant genetic alternatives to producers across the brown soil zone. We feel that there will always be a need to show producers new varieties and aid them with adoption of new superior genetic technology.

G. Information on Performance Indicators:

Growing pulses in Saskatchewan is not an easy task. Choosing the right variety is a positive step towards success. The demonstration of pulse crops and the resulting data (yield, maturity, disease ratings, standability, and plant height) is invaluable resource to producers risking resources on inputs. Showcasing this information will minimize this risk. New varieties offer greater yield potential, which in turn means extra profit to the producer. Disease resistance breed into these new varieties may result in less spray needed to maintain the crop. This will decrease the producers' expenses and therefore increase profits. Most importantly, showing these new varieties to producers has helped them to diversify into new crops.

A. Swine Manure Carryover in a Cereal / Pulse Crop Rotation (year 4)

B. Summary

The purpose of the study was to evaluate the impact of swine manure carryover and it's affect on barley, durum and peas. The trial was conducted in the 2002 growing season at Success, Saskatchewan and was the fourth season we have been measuring the carryover effects of varying rates of swine manure applied in the fall of 1998. In previous studies we determined there was a very definite response to all rates of swine manure in year one and two after manure application. In year three after application a response was seen only at the high rate of application. Three growing seasons after swine manure had been applied, there were not sufficient nutrients in the soil to positively affect yield.

C. Background and objectives of study

The rapid increase in hog production has led to producer and public demand that swine manure be handled in an environmentally sustainable manner and applied to the soil with the least possible nutrient escape and odour. PAMI (Prairie Agricultural Machinery Institute) has worked to develop technology which addresses these concerns and, along with Wheatland Conservation Area, realized the need to further examine the agronomic benefits that exist with the use of swine manure as a fertilizer. As barns continue to grow so does the demand for locally grown, quality feed such as peas and barley. With surrounding land required for both production of feed and removal of manure, there is a need to know how one affects the other in a cropping rotation. Wheatland (WCA) would like to encourage the cooperation between farmer and hog producer to show them how a symbiotic relationship will benefit their long term sustainability. WCA would also like to further prove the value of swine manure as a fertilizer and to show producers how it can be effectively used in a pulse crop rotation.

D. Study description

In the fall of 1998 swine manure was injected at three different rates (3000, 6000, 9000 gallons per acre (gpa)). Urea was also deep banded with a Flexi-coil 5000 air drill at 50, 100, 150 lbs/acre of actual N. Total N levels were equivalent for both formulations. No additional fertilizer has been applied to the soil since the fall of 1998.

The first year of the study dealt with the injection process and odour management. A producer tour was held in the fall of 1998 to demonstrate the equipment in action as the manure was injected. The tour group was impressed with the equipment and the absence of odour throughout the afternoon.

The next two years of testing looked at how durum responded to the various treatments. The third year of the study looked at how chickpeas, peas, and barley respond to possible nutrient carry over from 1998. The fourth year of the study examined growing a barley and durum on pulse stubbles and growing peas on barley stubble.

E.Results and conclusions

Results from this study were impressive. Durum yields and proteins in 1999 were as good or better when fertilized with swine manure as compared to their urea counterparts. In 2000, there was enough carry over nutrient in the 6000 and 9000 gal/ac swine manure and the 150 lbs/ac urea treatments to significantly increase durum yield and protein.

In 2001, there is enough nutrient carryover from the 9000 gpa treatment to positively affect yield in barley, and negatively affect yield in the pulses. Response in the peas and chickpeas were similar. Barley yields drop significantly on plots receiving 6000 and 3000 gpa of swine manure as well as all the urea treatments, yet remaining significantly higher than the check that received no manure or urea

Pulse yields increase significantly as manure application rates decrease. The same trend occurs with the urea treatments although the differences are not significant. This negative yield response appears to be the result of poor nodulation in the pulses due to additional nutrient carryover and a soil moisture deficit from previous crops. Plots receiving high rates of manure and fertilizer in 1998 produced high durum yields in 1999 and 2000. These high yielding crops may have created a moisture deficit for the third year pulse crop in 2001, a year already plagued with drought.

In 2002 there was no yield advantage in the swine manure plots as compared to the urea plots. The level at which the swine manure or urea was applied in the initial year did not increase yield. The level of nutrients in the soil was not adequate to grow a successful crop. The soil nutrient levels must be topped up in the fourth growing season after manure application in order to ensure a successful crop.

Table 1. Mean yield 2002

Crop	Treatment	Yield Bu/Ac	Crop	Treatment	Yield Bu/Ac	Crop	Treatment	Yield Bu/Ac
durum	untreated check	8.16 a	barley	urea 100 lbs/ac	8.77 a	pea	urea 100 lbs/ac	20.17 a
durum	urea 100 lbs/ac	8.10 a	barley	swine manure 3000 gpa	8.44 a	pea	urea 50 lbs/ac	19.00 ab
durum	swine manure 3000 gpa	7.94 a	barley	swine manure 6000 gpa	7.98 a	pea	swine manure 3000 gpa	18.97 abc
durum	swine manure 9000 gpa	7.83 a	barley	swine manure 9000 gpa	6.95 b	pea	untreated check	18.55 bc
durum	swine manure 6000 gpa	7.68 ab	barley	urea 50 lbs/ac	6.85 b	pea	swine manure 9000 gpa	18.09 bc

durum	urea 50 lbs/ac	7.22 b	barley	untreated check	6.51 b	pea	urea 150 lbs/ac	17.58 c
durum	urea 150 lbs/ac	7.18 b	barley	urea 150 lbs/ac	6.16 b	pea	swine manure 6000 gpa	15.59 d

F. Indication for further development

Based on the results obtained it appears that swine manure will not adequately supply nutrients to four successive crops. The use of swine manure in a successful crop rotation needs to be further examined. Research could be conducted looking at supplemental fertilizing in order to extend the benefits of swine manure. Another aspect of swine manure which requires testing is the period between various application rates of swine manure on different soil types. Producers need to know how often and at what rate they can apply manure to their soil. Environmentally and agronomic information must be developed for manure applications.

G. Information on performance indicators

Diversification and value added are terms associated with the hog industry. Improving land use efficiency in areas surrounding these barns benefits both the hog industry and area producers. The symbiotic relationship between the producer and the hog industry should grow, and will encourage further cooperation between the two groups.

South East Research Farm
Redvers

Kevin Heal B.Sc - Manager

The South East Prairie Rural Development Co-op (SEPRDC) was incorporated "not for profit" under the Co-operative Act in 1989.
Began as part of the Spoke Program under the Special Crop Area of Agri-Food Innovation Fund and was managed by South East Prairie Rural Development Coop Ltd.The Co-operative is made up of members who are local urban and rural municipalities. The South East Research Farm is located on 160 acres south east of Redvers. The mission of the SEPRDC is to serve an inter-municipal area working towards maintaining and improving the economic and social quality of life through job creation and resource, business and community development.

SERF has co-investigated projects with AAFC – Brandon, MB, University of Saskatchewan, Saskatchewan Soil Conservation Association and Industry.

A. Timing of Nitrogen Fertilizer Application on Dry Beans

B. Summary

Dry bean production has been increasing in Saskatchewan in recent years. With regards to the timing of nitrogen fertilizer application for dry beans, there have been few investigations conducted. A study conducted at Redvers, investigated the timing of nitrogen fertilizer application in dry beans. Nitrogen fertilizer was applied at different stages during the growing season. The variety Pintium cv bean was used for the trial. The treatments consisted of: 0 lbsN/ac at seeding, 70 lbsN/ac at seeding, 35 lbsN/ac at seeding plus 35 lbsN/ac. at first trifoliate, 35 lbsN/ac at seeding plus 35 lbsN/ac at first flower, 0 lbsN/ac with 70 lbsN/ac at first trifoliate, and 0 lbsN/ac at seeding with 70 lbsN/ac at first flower. The seed yields were compared to assess differences among treatments.

C. Background and Objectives

With the development of early maturing varieties such as Pintium, dry bean production has the potential to increase within the province, especially in the south-eastern corner. Some production practices for dry beans need to be addressed with respect to seeding and fertility. The objective of this trial is to investigate the optimum timing of nitrogen fertilizer application in order for producers to get maximum yields out of their bean crops.

D. Trial Description

The trial was conducted in Redvers during the 2002 growing season. A randomized complete block design (RBCD) with four replicates was used consisting of six treatments: 0 lbsN/ac, 70 lbsN/ac side banded at seeding, 35 lbsN/ac side banded at seeding with 35 lbsN/ac broadcast at third trifoliate, 35 lbsN/ac side banded at seeding with 35 lbsN/ac broadcast at first flower, 0 lbsN/ac at seeding with 70 lbsN/ac broadcast at third trifoliate, and 0 lbsN/ac at seeding with 70 lbsN/ac broadcast at first flower. All treatments received 20 lbs/ac of phosphate side banded one inch below and one inch to the side of the seed row at seeding. Nitrogen form used was urea (46-0-0). Parameters measured were plant density, plant height, seed weight, and grain yield.

E. Results and Conclusions

There were no significant differences in plant density, height, or seed weight among treatments. There was a significant difference in yield when the N was applied at 70 lbs/ac during first flower ($P<0.05$), but otherwise there were no differences in yield among treatments.

From the results of this trial there was no difference in yield relative to the timing of nitrogen application. However the highest yields were measured in the plot that received the nitrogen at seeding. Repetition of the experiment will reduce the variability and confirm our preliminary findings.

Table 1. Redvers 2002 Bean Agronomy Means

Treatment	Density (m^2)	Plant Height (cm)	Seed Weight (g/1000 seeds)	ield (kg/ha)
0 N	31	32.2	430	1257.15
70 lb. N at seeding	25	35.3	422	1482.83
35 lb. N at seeding + 35 lb. N at third trifoliate	22	35.8	425	1165.98
35 lb. N at seeding + 35 lb. N at first flower	23	33.9	430	1246.57
0 N at seeding + 70 lb. N at third trifoliate	29	33.7	425	1231.80
0 N at seeding + 70 lb. N at first flower	33	31.4	435	935.77
LSD	*N.S.*	*N.S.*	*N.S.*	*455.91*

A. 2002 Redvers Warm Season/Cool Season (C3/C4) Annual Forage Trial

B. Summary

The purpose of the trial was to investigate the potential of cool-season and warm-season crops for forage production and to evaluate the early seeding and late seeding of those forage crops for quality, biomass production and competition. In a trial conducted at the South East Research Farm in Redvers during the 2002 growing season, warm season forage crops were compared with cool season crops. There were two seeding dates for the trial, an early date (May 17) and a late date (June 17). In the early seeded date, the cool season crops had higher biomass than the warm season crops and the opposite trend occurred in the late seeded date. The crop with the highest biomass was the sorghum-sudangrass for the warm season crops, and the oats were the highest cool season crop. Out of the millets, White Wonder and Golden German produced the most biomass.

C. Background and Objectives

Livestock producers in Saskatchewan have typically grown annual cool season forage crops such as oats and barley, but in recent years there has been an interest in growing warm season annuals. Forage millet varieties have been grown in warmer parts of the world for years, where larger growing degree days are associated with a longer growing season. To investigate the potential of growing warm season annual forages in Saskatchewan, various AgriARM sites including the South East Research Farm at Redvers conducted trials during the 2002 growing season. In the trial at Redvers, eight warm season forage crops were evaluated with four cool season forage crops for feed quality.

D. Trial Description

The trial was conducted at Redvers during the 2002 growing season. A randomized complete block design (RCBD) with four replicates was seeded at two dates and 12 cultivars: Fatima Fababean; AC Pinnacle oats; Ranger barley; Sandrow triticale; AC Prairie Gold Proso, Golden German, Strain R German, White Wonder foxtail, Siberian Red foxtail, Mil-Hy 300 pearl, and Crown millets; and Megagreen Sorghum-Sudangrass. All treatments received 40 lb/ac Nitrogen and 20 lb/ac Phosphate side-banded one inch below and one inch to the side of the seed row at seeding. Seeding dates for the trial were May 17 and June 17. Parameters measured on the treatments were: plant counts, height, and above-ground biomass at different dates/stages.

E. Results and Conclusions

There were significant differences in dry matter biomass among the treatments for both seeding dates. When comparing the biomasses between the two seeding dates, the cool season crops (barley, oats, triticale) were higher for the early seeding date than the late seeding date, with the opposite occurring for the warm season crops. The highest biomass for a cool season crop was the oat, while the highest warm season crop was the

sorghum sudangrass. Of the millets, the White Wonder and Golden German were the highest biomass producers. The variation of harvest dates between the warm and cool seeding blocks was due to the different maturity dates. In the early seeded block, the warm season crops were still in the vegetative stage, while the cool season crops were headed out for the first two harvest dates, and in the last two harvest dates the Strain R and sorghum were just beginning to head out. The same pattern could be seen in the warm season block, during the last harvest date the sorghum was 2.4 metres in height.

In both seeding dates, there was one treatment that had poor establishment, the Mil-Hy millet. As a result, the Mil-Hy was not included in any of the data collection. Also, the fababeans were only harvested twice in the first seeding date and once in the second seeding date because of grasshopper infestations.

Table 1. Redvers C3/C4 annual forage trial 2002 early seeding date mean data

Treatment	Biomass (g/m^2 dry matter) at 75 days	Biomass (g/m^2 dry matter) at 84 days	Biomass (g/m^2 dry matter) at 94 days	Biomass (g/m^2 dry matter) at 109 days
Fatima Fababean	288.25	360.75	N/A	N/A
AC Pinnacle Oats	730.50	908.50	N/A	N/A
Ranger Barley	678.00	760.25	N/A	N/A
Sandrow Triticale	525.75	668.50	N/A	N/A
AC Prairie Gold Proso	488.75	536.50	N/A	N/A
Golden German	N/A	525.50	623.75	874.50
Strain R	N/A	491.00	554.75	768.00
White Wonder	N/A	473.75	550.75	788.25
Siberian Red	505.75	583.25	N/A	N/A
Mil-Hy 300	N/A	N/A	N/A	N/A
Megagreen Sorghum-Sudangrass	N/A	385.50	550.50	700.50
Crown Millet	475.75	515.50	N/A	N/A
LSD	*173.69*	*167.34*	*295.86*	*263.63*

Table 2. Redvers C3/C4 annual forage trial 2002 late seeding date mean data

Treatment	Biomass (g/m^2 dry matter) at 64 days	Biomass (g/m^2 dry matter) at 79 days	Biomass (g/m^2 dry matter) at 98 days
Fatima Fababean	327.00	N/A	N/A
AC Pinnacle Oats	733.00	718.75	N/A
Ranger Barley	574.75	666.25	N/A
Sandrow Triticale	492.75	478.75	N/A
AC Prairie Gold Proso	633.25	653.25	N/A
Golden German	489.00	606.00	726.00
Strain R	450.50	477.50	697.00
White Wonder	524.00	628.50	924.50
Siberian Red	549.75	658.50	N/A
Mil-Hy 300	N/A	N/A	N/A
Megagreen Sorghum-Sudangrass	720.25	614.75	1123.50
Crown Millet	645.75	579.25	N/A
LSD	*190.01*	*181.12*	*226.99*

A. 2002 Canola Variety Trial

B. Summary

The purpose of this trial was to evaluate canola varieties available for producers in the Redvers area. There were ten varieties in the trial consisting of six Roundup Ready, one Clearfield, two Liberty Link, and one conventional. There were significant differences in yield, height, and days to maturity, with Invigor 2573 having the greatest yield and Hylite 225 having the lowest yield. The earliest maturing varieties were Hylite 225 and Hylite 289, while Hyola 519 and Hyola 505 had the longest days to maturity. Seed green count was neglible.

C. Background and Objectives

Similar to other crops, canola has a wide range of varieties available for producers to grow. With the introduction of herbicide resistant varieties, producers have even more options to choose from. In conjunction with the Redvers Co-op, the South East Research Farm conducted a canola variety trial for the 2002 growing season. The trial evaluated several canola varieties in the terms of yield, plant height, and days to maturity.

D. Trial Description

The trial was conducted at Redvers during the 2002 growing season. A randomized complete block design (RCBD) with three replicates was used consisting of ten varieties: Hyola 505, Hyola 519, Hylite 225, Fieldking 811, DKL 34-55, and DKL 35-85 Roundup Ready canola; Hylite 289 Clearfield canola; Invigor 2573 and Invigor 2733 Liberty Link canola; and Thunder conventional canola. All treatments received 70 lb/ac Nitrogen, 20 lb/ac Phosphate and 10 lb/ac Sulphur side-banded one inch below and one inch to the side of the seed row at seeding. To simulate swathing, all plots were pushed over at their date of maturity (100 days after seeding). Parameters measured on the varieties were: height, days to maturity, and yield.

E. Results and Conclusions

There were significant differences in height, yield and days to maturity among the treatments. The highest yielding variety was Invigor 2573, followed by Hyola 519, Fieldking 811, and DKL 35-85 respectively. The lowest yielding varieties were Hylite 225, Hylite 289, Thunder, and DKL 34-35. The earliest maturing varieties were Hylite 225 and Hylite 289, while the latest maturing varieties were Hyola 505 and Hyola 519. In regards to plant height, the two shortest varieties were DKL 34-55 and DKL 35-85, while the two tallest varieties were Hyola 505 and Invigor 2753. A neglible green count was measured in all varieties.

Table 1. Redvers canola variety trial 2002 mean data

Variety	Type	Height (cm)	Days to Maturity	Yield (kg/ha)
Hyola 505	Roundup Ready	134.0	100.0	2023.95
Hyola 519	Roundup Ready	108.0	100.0	2295.49
Hylite 225	Roundup Ready	101.0	95.0	1462.98
Fieldking 811	Roundup Ready	108.0	99.0	2282.75
DKL 34-55	Roundup Ready	97.7	98.0	1747.26
DKL 35-85	Roundup Ready	98.0	98.0	2250.79
Hylite 289	Clearfield	101.0	95.0	1486.22
Invigor 2573	Liberty Link	127.0	96.0	2617.09
Invigor 2733	Liberty Link	106.0	97.0	2029.78
Thunder	Conventional	122.0	96.0	1536.86
LSD				*851.83*

Table 1. Redvers Mean Data 2002

Variety	Count (m row)	Yield (kg/ha)
Electra	34	443
Escalina	18	360
Caesar	20	267
Evelin	39	820
Hermes	54	515
Valour	27	480
Ilona	50	668
Vimy	58	678
Diane	39	681
Diva	28	352
LSD	26.98	329.64

A. Flax Fibre Harvesting Trial

B. Summary

The purpose of the trial was to evaluate the in-field retting process of flax fibre for quality. Two flax varieties, CDC Bethune and Hermes, were seeded at three rates and harvested at three heights. After harvest, the flax straw was laid down and will be allowed to ret over the winter. CDC Bethune had the highest seed yield

C. Background and Objectives of Trial

Producers have generally grown flax for its seed while paying little attention to its fibre content because of the lack of fibre processors. With the increased demand for flax fibre from foreign markets, Saskatchewan producers have the opportunity to become a leader for producing high quality flax. The objective of this trial is to determine the most effect seeding density and cutting height to produce good fibre after allowing the straw to ret in the field.

D. Trial Description

The trial was conducted at Redvers during the 2002 growing season. A randomised block design with three replicates was used with six treatments: CDC Bethune oilseed flax seeded at 44, 88, and 132 lb/ac, and Hermes fibre flax seeded at 44, 88, and 132 lb/ac. All treatments received 30 lb/ac Nitrogen side banded one inch below and on inch beside the seed row at seeding. The treatments were harvested at three cutting heights: whole plants hand picked, low cutting height, and high cutting height (underneath bolls). The samples were then either laid on the ground for retting (whole plants), or rolled (flattened) with a bean roller and allowed to ret.

E. Results and Conclusions

There was a significant difference in yields between the two flax varieties, but not among the seeding rates for each variety. Fibre quality of the treatments will not be determined until the spring of 2003.

Table 1. Redvers mean data 2002

Variety	Treatment	Yield (kg/ha)
CDC Bethune	49 kg/ha	672
	98 kg/ha	594
	148 kg/ha	614
Hermes	49 kg/ha	236
	98 kg/ha	328
	148 kg/ha	251
LSD		171.5

A. Flax Fibre Variety Trial

B. Summary

The purpose of this trial is to evaluate the fibre quality and yields of various flax varieties. Ten flax varieties (8 fibre, 2 oilseed) were evaluated for yield and fibre quality. The yields obtained had some significant differences between varieties, but it was not correlated to plant counts. The fibre quality of the varieties will be determined in the spring of 2003.

C. Background and Objectives

Flax has been grown on the prairies generally for its seed and oil content, but demand for fibre flax has been increasing in foreign markets. Currently there is an adequate amount of information about oilseed flax varieties in the prairies, but not on the different fibre varieties. Also, the majority of fibre flax varieties come from Europe, and may not be adapted to the prairie environment. The objectives of this trial are to evaluate the different fibre varieties for their yield, fibre quality, and their adaptability.

D. Trial Description

The trial was conducted at Redvers during the 2002 growing season. A randomized complete block design (RCBD) with four replicates was used consisting of ten treatments/varieties: Electra, Escalina, Caesar, Evelin, Hermes, Valour, Ilona, Vimy, Diane, and Diva. All treatments received 50 lbsN/ac side-banded one inch to the side and one inch below the seed row at seeding. Prior to harvest, one square metre samples were taken from each plot and will be allowed to ret in-field over the winter and fibre quality will be determined the following spring. Parameters measured on the varieties were: plant density, yield, and fibre quality.

E. Results and Conclusions

There were some differences in both plant count and yield within the treatments. Counts for Escalina and Caesar were significantly lower than Vimy and Ilona ($p<0.05$). However the differences in yield do not correspond to the differences in counts. Significant differences in yield was observed in Caesar and Diva ($p<0.05$) compared to Evelin. The fibre quality of each variety will be determined in the spring of 2003.

A. Greenfallow Termination

B. Summary

The use of green manure for increasing soil fertility is a practice used by organic producers as well as those who aim to lower fertilizer costs. Pulses obtain most of the N required for growth through a process called 'Nitrogen fixation'. The plant material is terminated and incorporated into the soil, returning the N contained in the biomass to the soil for the following crop. AC Greenfix, a chickling vetch, has an advantage over other pulses used for green manure because of its lower seeding rates (70 lbs/ac) and high N fixing ability. Three crops were seeded to evaluate fertility effects on wheat recrop: canola (non N-fixing check), field pea, and AC Greenfix. This is the first year of the trial, and wheat will be seeded on the stubbles next spring to assess recropping effects.

C. Background

Green manure is an alternative source of N to commercial fertilizers for producers. Nitrogen fixation is a biological process where the plant fixes atmospheric N into biomass for incorporation into the soil profile. AC Greenfix, a chickling vetch, is a relatively new legume variety developed exclusively for green manure. It has an advantage over other legumes in that it fixes the same amount of nitrogen, but at a lower seeding rate (70 lbs/ac.). It cannot be used for forage because of its high levels of neurotoxins, but is an excellent manure crop. The objective of this trial is to demonstrate the potential benefits of using green manure or fallow in a cropping system.

D.Trial Description

The trial was conducted at Redvers during the 2002-2003 growing seasons for the purpose of investigating and demonstrating the potential benefits of green fallow in a cropping system. There are 9 treatments in total consisting of 3 types of crops being used as a green manure: canola (a non-nitrogen fixing crop), field pea, and chickling vetch (AC Greenfix), as well as 3 different methods of incorporation: tilling into the ground at mid-flowering, terminating at mid-flowering by herbicide (glyphosate), and harvesting the seed. The stubbles will be seeded to wheat in the spring of 2003, and observations will be taken on the nitrogen response, water usage, and weed competition densities.

A. Minor Use Sunflower Trial 2002

B. Summary

The purpose of this trial was to evaluate the broadleaf weed control in sunflowers of a pre-emergent herbicide with a post-emergent herbicide. The trial was conducted in Redvers in 2002. The pre-emergent herbicide, sulfentrazone, was applied at two different rates, while the post-emergent, Assert, was applied at its single rate. There were no significant differences in yields among the treatments, but there were differences in control ratings, with the sulfentrazone sprayed at a double rate having the greatest control. It was noted that the sulfentrazone was applied when the sunflowers were emerging, and as a result suffered some leaf burn on the first two leaves, which may account for some slight differences in yields.

C. Background and Objectives

In order for a new herbicide to become registered for use, it has to be evaluated on its effectiveness. Sulfentrazone is a pre-emergent broadleaf herbicide for sunflowers that is being evaluated for its effectiveness at different rates. The South East Research Farm in Redvers was one site selected to evaluate sulfentrazone on its broadleaf weed control with that of Assert, a post-emergent broadleaf weed herbicide.

D. Trial Description

The trial was conducted in Redvers during the 2002 growing season. A randomized complete block design (RCBD) with four replicates was used consisting of four treatments: untreated (weedy) check, Sulfentrazone at 140 g/l active ingredient pre-emergent, Sulfetrazone at 280 g/l pre-emergent, and Assert at 250 g/l post emergent. All treatments received 60 lb/ac Nitrogen and 35 lb/ac Phosphate side banded one inch below and one inch to the side of the seed row at seeding. Parameters measured on the treatments were: broadleaf weed control rating and grain yield. The control ratings were based on a scale from zero to one hundred, with zero having no control and one hundred having complete control.

E. Results and Conclusions

There were no significant differences in yield among the treatments; however there were significant differences in control ratings. The treatment with the highest control rating was the sulfentrazone at the double rate. There were noticeable differences in control ratings between the single rate sulfentrazone and the Assert treatments, but with no significance.

The sulfentrazone treatments were supposed to be sprayed before the sunflowers had emerged, however in both treatments the sunflowers were just beginning to emerge as the sulfentrazone was applied. As a result, the sunflowers had severe leaf burn for the first

two leaf stages and were set back, which may have resulted in a decrease in overall yields in these two treatments. There were no more noticeable marks on successive leaves from the two treatments.

Table 1. Redvers minor use sunflower mean data 2002.

Treatment	Control Rating	Yield (kg/ha)
Untreated (weedy)	16.25	2261.18
Sulfentrazone (single rate)	58.75	2465.08
Sulfentrazone (double rate)	82.50	2280.01
Assert (single rate)	41.25	2567.03
LSD	*37.13*	*N.S.*

A. Pesticide Free Production (PFP) Trial

B. Summary

The purpose of this trial was to introduce producers with the concept of Pesticide Free Production practices as an alternative to conventional practices. The trial was conducted at Redvers in 2002. There were noticeable but not significant differences in both yields and plant densities between the PFP and conventionally grown crops. The PFP crops had higher densities, but lower yields than the conventional crops. One explanation for the differences in yields could be due to higher weed competition rates in the PFP crops.

C. Background and Objectives

With the continual rise of input costs, Pesticide Free Production (PFP) is a new option for producers trying to control their expenses, or for producers who are in the transition from conventional farming to organic. PFP is more flexible than organic farming, as it allows the use of fertilizers and off-season use of pesticides (pre-seed burnoff, post harvest weed control, etc.). It also may result in the development of new markets with the possibility of market premiums for foods coming from reduced pesticide use. The objective of the trial was to demonstrate the practice of Pesticide Free Production (PFP), using a cereal, pulse, and oilseed crop for comparisons.

D. Trial Description

The trial was conducted in Redvers during the 2002 growing season. A randomized complete block design (RCBD) with four replicates was used consisting of six treatments: conventional wheat seeded at 90 lb/ac, PFP wheat seeded at 116 lb/ac, conventional field pea seeded at 180 lb/ac, PFP field pea seeded at 220 lb/ac, conventional flax seeded at 45 lb/ac, and PFP flax seeded at 56 lb/ac. The wheat and flax treatments received 60 lb/ac Nitrogen and 20 lb/ac Phosphate and the pea treatments received 20 lb/ac P and inoculant, which were side-banded one inch below and one inch to the side of the seed row at seeding. Parameters measured on the treatments were: plant density and grain yield.

E. Results and Conclusions

When comparing the conventionally grown crops with the PFP crops, there are noticeable but not significant differences in both yields and densities. The conventionally grown crops yielded better than the PFP crops, even though the PFP crops had higher plant densities. One explanation for these differences could be the higher weed competition rates in the PFP crops resulting in lower yields than in the conventional crops.

When considering using PFP instead of conventional production, there is a higher premium for PFP crops plus the fact of lower in-crop pesticide costs with the PFP.

Table 1. Redvers pesticide free production trial 2002 mean data

Crop	Treatment	Density (m)	Yield (kg/ha)
Wheat	Conventional	110.25	1789.90
Pea	Conventional	16.75	2844.42
Flax	Conventional	73.12	1264.47
Wheat	PFP	114.37	1548.49
Pea	PFP	19.37	2670.61
Flax	PFP	105.87	1002.75
LSD		*24.38 (N.S.)*	*542.84 (N.S.)*

Soybean Variety Trial

Summary

The purpose of this trial was to evaluate soybean varieties for their adaptability to the southern prairies. In terms of overall yield and plant height, the highest yielding varieties were also the tallest. Due to a cool growing season and an early killing frost, the yields of some of the varieties were much lower than expected. Soybeans continue to be a gamble for most production years in Saskatchewan.

Background and Objectives

Soybeans have been grown in eastern Canada for quite a few years, and interest for soybean production in western Canada has increased. In places such as Manitoba and south-eastern Saskatchewan, soybean production can be a possibility. In a trial conducted at Redvers, nine soybean varieties were evaluated for adaptation.

Trial Description

The trial was conducted at Redvers during the 2002 growing season. A randomized complete block design (RCBD) with three replicates was used consisting of nine treatments/varieties: Ustya, OAC Prudence, OAC Vision, Gentleman, Chernyatka, 90A07, GG 469, TER 426, and TER 353. All treatments received 20 lbs./ac Phosphate side-banded one inch below and one inch to the side of the seed row at the time of seeding. Granular soybean inoculant was also applied to the seed at the time of seeding. Parameters measured on the varieties were: height, days to flowering, days to maturity, seed weight, and grain yield.

Results and Conclusions

There were significant differences among the varieties with regards to height, yield, and days to flowering. The varieties that had the highest yields, Gentleman, and OAC Prudence, were also the tallest. 90A07, which was the third highest yielding, was among the shorter varieties. However, the three shortest varieties, GGG 469, TER 426, and TER 353, were also the lowest yielding. There were no significant differences in seed weights, even though the weights do vary (LSD for seed weight was 310.5). With respect to the days to maturity, there were significant differences observed, but normally would be longer than recorded, as a killing frost occurred just as some of the varieties were beginning to have pod filling.

Overall, the varieties with the highest yields were also those which were the tallest. Due to the relatively cool growing season and an early killing frost, the yields for some of the varieties were lower than expected especially the TER 353, which had the lowest yields. Also, there was noticeable frost damage on the seeds of the lower yielding varieties (a visible yellowish-clear tinge), mainly on the GG 469 and TER 353.

Table 1. Redvers Soybean Variety Mean Data.

Variety	Height (cm)	Days to Flowering	Days to Maturity	Seed Weight (1000 seeds/g)	Yield (kg/ha)
Ustya	65.9	72.0	124.3	300.0	1520.9
OAC Prudence	67.5	73.3	125.0	470.0	1805.1
OAC Vision	58.4	72.7	123.0	330.0	1089.2
Gentleman	67.0	73.3	123.0	296.7	2119.4
Chernyatka	59.6	76.0	124.3	440.0	1346.6
90A07	56.9	73.3	125.0	300.0	1734.4
GG 469	55.6	76.0	125.0	293.3	526.7
TER 426	39.8	70.0	116.0	433.3	867.8
TER 353	43.9	72.0	125.0	593.3	218.5
LSD	*17.4*	*3.3*	*1.1*	*N.S.*	*532.3*

A. Winter Wheat Establishment on Annual Forage Stubble

B. Summary

The purpose of this trial is to investigate the responses of a winter cereal after it has been established on various annual forage stubbles. Primary effects to be investigated will be the amount of water use and nitrogen use the various forages had and their effect on the subsequent winter wheat crop. Plant densities, plant height, and grain yield measurements will be taken during the 2003 season.

C. Background and Objectives

With an increased interest in growing annual warm season forage crops in Saskatchewan little is known about their nitrogen use and water uptake, and the resulting effects on following crops. As well, since most of the crops will be taken off the fields relatively early, there is an opportunity to seed a winter cereal for grazing or grain production. The South East Research Farm in Redvers addressed this need by seeding winter wheat on twelve forage crop stubbles in order to determine any significant differences in nitrogen and water use which the forage crops may have. The trial will be conducted during the 2002 and 2003 growing seasons.

D. Trial Description

This trial began in the 2002 growing season and continued onto the 2003 growing season in Redvers. A randomized complete block design (RCBD) with four replications was used consisting of twelve treatments: forage stubble from an annual forage trial conducted during the 2002 season seeded to winter wheat in the fall. The stubbles were from the following forage crops: Fatima Fababean; AC Pinnacle oats; Ranger barley; Sandrow triticale; AC Prairie Gold Proso, Golden German, Strain R German, White Wonder foxtail, Siberian Red foxtail, Mil-Hy 300 pearl, and Crown millets; and Megagreen Sorghum-Sudangrass. All treatments received 10 lb/ac Nitrogen and 20 lb/ac Phosphate side-banded one inch below and one inch to the side of the seed row at seeding. Parameters to be measured on the treatments will be plant density, plant height, seed weight, and grain yield.

South East Research Farm 2002 Field Day

The South-East Research Farm's annual field day was held on Wednesday July 24 with a high attendance rate from local producers and agriculture industry representatives. The total count of attendants was 156 people, which when broken down into various groups included: producers at 95 attendees, industry and government with 41 attendees, staff and speakers at 14, and students (local children) with 6 attendees. Some of the various industry attendees present included representatives from Brett-Young Seeds, Aventis/Bayer, Agricore United, Pioneer Grain, and Sask Wheat Pool (from local areas), as well as some non-local representatives from Agricore United and Pioneer whom expressed interest in conducting future trials at the farm. There were even some industry representatives from Guelph Ontario, who were interested in learning more about prairie agriculture. Other industry representatives in attendance included members from the CWB, Ducks Unlimited, Sask Crop Insurance, and Municipal Hail. Government representatives in attendance were mostly from SAFRR and AAFC.

The field day had a wide array of trials ranging from forage to crop variety trials with representatives speaking about each. There were three forage trials shown: a perennial forage, a warm season/cool season (millet) forage, and a yellowfeed forage, with local forage specialist Lorne Klein speaking about each of them. The variety trials had various types of crops including: a regional bean variety trial from the University of Saskatchewan which Dr. Bert Vandenberg spoke about; a Canadain Wheat Board trial, showing various wheat and barley varieties, which CWB Agrologist Mike Grenier talked about; a flax fibre trial showing various fibre flax varieties which Alvin Ulrich from Biolin talked about; and a canola trial which had industry reps give a brief talk about the different canola varieties being grown. Other research projects that were shown during the day included: dry bean agronomy trials, looking at seeding and fertility rates and application timing as well as at fungicide treatments; a field pea inoculant trial from Agribiotics, comparing different inoculants for field peas; a Pesticide Free Production (PFP) demonstration, introducing producers to the concept of PFP; a greenfallow termination trial, in which chickling vetch (AC Greenfix) is being compared to that of field pea and canola for green manure.

Along with showing various trials throughout the day, there were some demonstrations done for a change of pace. SAFRR area extension agrologist Grant McLean gave a pesticide handling safety demonstration, showing the correct procedures for handling pesticides. Brian Caldwell from AAFC Saskatoon gave a sprayer nozzle demonstration, comparing similarities and differences between single and double spray nozzles. SAFRR provincial disease specialist Penny Pearse gave an update on the levels of crop diseases within the area. And to close off the day, Grant McLean gave a quick update on the insect monitoring situation.

Everyone left the field day a little more informed from the projects presented by the industry and government representatives. Coupled with the nice weather that day, the field day was a success.

Seager Wheeler Farm
Rosthern

Janine Kopanko-Kerber

The Seager Wheeler Historical Farm Society is an incorporated non-profit organization operated by a Board of Directors. It purchased parts of the historic Seager Wheeler farm between 1992 and 1996 as an agricultural education venue for rural and urban people. Land base is 480 acres with access to additional land and cattle for future projects. Part of the Seager Wheeler farm mission is to research applied science and demonstrate new special crops technology including forages to producers in the Thin Black soil zone of north central Saskatchewan and to advance the adaptation of special crops into extended rotations, thereby improving producer's economic returns and long-term sustainability of their operations and the environment.

A. Round Up Ready Corn Annual Forage Trial

B. Summary

The purpose of this study was to evaluate the feed quality of hybrid corn grown in the Rosthern area for beef cattle. A trial was conducted at the Seager Wheeler Farm in 2002. Samples were taken and analyzed for TDN, DE, NEl, NEm, and NEg of RoundUp Ready Corn. The results show that the feed is of good quality for beef. Depending on the stage in production of the beef, some supplements may be required.

C. Background and Objectives of Study

Corn is a commonly used annual forage in the U.S and other parts of Canada but is relatively new to our area of Saskatchewan. Corn is often cut for silage but can also be grazed. The nutrient value is high with good digestibility. Producers in the area are interested in annual forage production, and corn is one of their options. The study at Rosthern was to see how well the corn would grow and what the feed quality for beef would be. The trial was conducted in the2002 crop year at the Seager Wheeler Farm Rosthern.

D. Study Description

Approximately 1 acre of RoundUp ready Hybrid Corn was seeded on May 16. The corn was seeded at a rate of 22 lbs/ acre with an air drill. The seeding depth was 2 ½ inches. 75lbs/ac N and 25lbs/ac P were seed placed. Clippings were taken on October 8, and analyzed for nutrient and energy quality.

E. Results and Conclusions

The estimated yield was 10 tons/acre wet or 3.4 tons/acre dry matter. The corn resulted in a high quality feed. The plants did remarkably well considering the severely dry growing conditions. This may in part have been due to the fact that the corn was seeded on summer fallow. There is also the possibility that the drought resulted in the ears not fully developing causing the nutrients to remain in the leaves. This would account for good quality throughout the plants.

The drought may also have caused the high nitrate levels to develop. The nitrate levels at the time of sampling were quite high. This can result in Nitrate poisoning in beef. For this reason producers are advised to test the nitrate levels before feeding. Making silage with the corn will reduce the nitrate levels but care must be taken. When feeding corn with high Nitrate levels green, do not allow the cows to eat the bottom 12-15 inches of stalk, as this is were the highest concentrations are.

		As Received	100% Dry Matter Basis
Moisture at 135C		66.90%	
Protein		2.90%	8.90%
Sodium (Na)-total		0.01%	0.02%
Phosphorus (P)-total		0.06%	0.18%
Potassium (K)-total		0.31%	0.95%
Calcium (Ca)-total		0.06%	0.25%
Magnesium (Mg)-total		0.13%	0.40%
Acid Detergent Fiber (ADF)		8.9	26.8
Nitrate		0.17%	0.51%

		As Received	100% Dry Matter Basis
Total Digestible Nutrients (TDN)		23.17%	70.01%
Digestible Energy (DE)		1.02Mcal/kg	3.09Mcal/kg
Net Energy for Lactation (NEl)		0.96Mcal/kg	1.60Mcal/kg
Net Energy for Maintenance (NEm)		0.98Mcal/kg	1.63Mcal/kg
Net Energy for Gain (NEg)		0.62Mcal/kg	1.03Mcal/kg

* Based on Beef

F. Indication for Further Development

The results indicate that Roundup Ready corn is a potential option for beef producers to use as forage. Further examination on the economics and agronomy aspects could be done in order to give producers a more complete picture. Analysis of corn after a growing season with sufficient precipitation would further indicate if the drought did cause the corn to display high nitrate levels.

G. Information on Performance Indicators

Beef producers are looking for alternate feed sources especially of high nutritional quality. Corn used as annual forage offers a new option. Research in this area will allow producers to make informed decisions when choosing annual forage varieties.

A. Annual Forage Trial

B. Summary

The purpose of this trial was to evaluate the feed quality of Virden Barley, CDC Baler Oats, AC Murphy Oats, CDC Bell Oats, Westford Barley, AC Ranger Barley, AC Hawkeye Barley, Sommerville Barley, Germany Golden Millet when grown in the Rosthern, Sask. area. This trial was conducted at the Seager Wheeler Farm. The total forage yield was measured. The protein, NDF (Neutral Detergent Fiber), and ADF (Acid Detergent Fiber) was also measured. The ADF and NDF were used to measure the RFV (Relative Feed Value). Westford Barley had the highest yield (kg DM/ha). Germany Golden Millet had the lowest yield (kg DM/ha). Virden barley had the highest RFV, and AC Murphy oats had the lowest RFV.

C. Background and Objectives of Study

The production of annual forages has become more popular in our area in the past few years. Many different crops are suitable for annual forage production, but few trials have taken place in the Rosthern area. This trial will help to build up the knowledge of annual forages that are suitable to this area.

D. Study Description

The trial was conducted at the Seager Wheeler Farm, Rosthern, Sask in the 2002 crop year. Four replications were seeded in the 60 x 124 foot plot. The varieties were seeded at the following rates: Virden Barley-110lbs/acre, CDC Baler Oat-100lbs/acre, AC Murphy Oat- 100lbs/acre, CDC Bell Oat-100lbs/acre, Westford Barley-110lbs/acre, AC Ranger Barley- 110lb/acre, AC Hawkeye Barley-110lbs/acre, Sommerville Barley-110lbs/acre. Seeding took place on June 5 and cutting took place on August 8. Total forage yield on a dry matter basis was calculated. Protein, NDF and ADF were measured for each variety. The RFV of each was calculated using their respective ADF and NDF values.

E. Results and Conclusions

The highest RFV's were found in the barley varieties. The protein was also higher in barley than oats. This would indicate that most of these barley varieties are a good choice for annual forage when compared to oats. The RFV of Westford Barley was not that much higher than the oat varieties. The Germany Golden Millet was higher in protein than the oat or barley varieties, but its RFV was not that much higher than the oats.

	Total Forage Yield (kg DM/ha)	Protein	NDF	ADF	RFV
Virden Barley	4735	12	48	21	146
CDC Baler Oat	3833	11	62	32	95
AC Murphy Oat	4225	11	65	35	88
CDC Bell Oat	3787	12	58	31	104
Westford Barley	4862	13	56	29	110
AC Ranger Barley	3859	13	49	22	137
AC Hawkeye Barley	4461	12	47	23	140
Sommerville Barley	4114	13	49	25	134
Germany Golden Millet	1945	16	56	29	109
Mean	3980	13	54	27	118

F. Indication for Further Development

The results from this trial indicate that most barley varieties would be a better choice for annual forage than oats. Further study could compare different varieties of annual forage to these. Agronomy and economic aspects could also be investigated to give a more complete set of data for producers to base their decisions on.

G. Information on Performance Indicators

Annual forage production has become a feed option that producers are turning to in our area. This research is important in allowing producers to make informed decisions. Alternate uses for grain varieties such as barley and oats are worthwhile investigating.

A. Post Emergent Fertilizer Trials

B. Summary

The purpose of this trial was to demonstrate and evaluate the effects of post emergent fertilizer application on AC Intrepid Wheat. Liquid nitrogen was added at different rates and using either a coulter or dribble band applicator. Due to extreme drought the results were not visually conclusive, and harvest was not feasible therefore eliminating the possibilities of analysis.

C. Back ground and Objectives of Study

The application of fertilizer post emergent is a newer concept that the Seager Wheeler Farm felt was in need of demonstration in our area. Studies have proven that post emergent fertilizer application is an option for producers, but large numbers have not adopted this method.

D. Study Description

The study was conducted at the Seager Wheeler Farm, Rosthern, Sask. for the 2002 crop year. The trial was conducted using field scale equipment. 30lbs/ac of liquid N was seed placed on May 11. On June 5 liquid N was applied in the varying rates in 300m strips. 30 lbs/ac coulter, 15 lbs/ac dribble band, 30 lbs/ac dribble band, 45/ac lbs dribble band.

E. Results and Conclusions

Results were inconclusive visually and no samples were taken for analysis due to the poor growth conditions that were experienced.

F. Indication for Further Development

This trial could be repeated at this site with hopes of better growing conditions. The severe drought was devastating this year.

G. Information on Performance Indicators

Producers need to be made aware of their options when it comes to fertilizer application. More interest is being shown in this area, which would validate further investigation and demonstration of post emergent fertilizer application.

Seager Wheeler Farm Pruning and Grafting Field Day
April 30, 2002

This cold spring field day was a success with 50 people attending. Following registration, the day started out with presentations given by Clarence Peters of SAFRR, Dr. Bob Bohrs of the Uof S and Rick Sawatzky from the Uof S. Slides were shown depicting different pruning techniques for fruit such as Apples, Dwarf Sour Cherries, Saskatoons, Sea buckthorn, and Raspberries. A question and answer session was held before heading out to the Orchard for demonstrations. The group split up and rotated between the three demonstrators to view pruning on all the fruit varieties. Everyone was invited to bring along their pruners, and were given a chance to practice with expert help close at hand. Handouts with pruning instructions were available along with coffee and doughnuts in the main building.

Seager Wheeler Farm
Seeding Trends 2002 "Looking Back –Looking Forward"
June 5, 2002

This very successful field day was held on June 5 at the Seager Wheeler Farm near Rosthern Saskatchewan. This year the day started with a visit and address from the honorable Clay Serby. The events continued with a producer panel sharing their experiences, concerns and vision for the future. Experts in the field then addressed their concerns. Producers then had a choice of attending "Timely Topics", a discussion on plant diseases, tissue testing and fertility issues, " Intensive Fruit Production", a field discussion discussing fruit production possibilities in Saskatchewan, or a "Forage Plot Tour" discussing annual and perennial forage choices. A roast beef lunch was served. Following the meal, keynote speakers discussed this year's theme "Looking back-Looking forward". Door Prizes were given away before everyone dispersed to their choice of either a seminar on "Potential of Commercial Vegetable Production in Saskatchewan", or a field demonstration of "Direct Seeding Do's and Don'ts and Sprayer Demonstrations". The next choice was between the "Post emergent Fertilizer Demonstration" and "The Flower Garden Walking Tour". The Day wrapped up with the main event of the day. The Direct Seeding Demonstration had twelve different companies participating this year. The day was host to over 650 people and is expected to exceed this number next year.

Seager Wheeler Farm Field Day
July 11, 2002

This day was sponsored in cooperation with the Extension Service at SAFRR and the SSCA. Registration of the 30 attendees began at 1:00. This was followed by a short introduction of the highlights for the afternoon. The first stop was the U of S variety trials. These were discussed by Brian Rossnagel (Barley and Oats breeder) and Curtis Pozniak (Wheat breeder). After this, a stop was made at the SSCA's Do's and Don'ts of Direct Seeding Demo Plots. These dealt with potash fertility trials. Rich Szwydky, of the SSCA, discussed these plots and also helped to explain the Post Emergent Fertility Demonstration trials at the next stop. The fertilizer application took place at seeding trends 2002 and many of the tours participants had been present for the application. They were very interested in seeing the results. The tour continued on to the last site to discuss the Annual Forage Plots. Dave Hryhor of SAFRR discussed annual forage production potential. The day wrapped up with a barbeque supper.

Seager Wheeler Farm Bean and Pulse Crop Field Day
July 30,2002

52 people interested in pulse crop production attended this event. The tour started with the U of S Crop Development Center's variety trials of beans, lentils and peas. The tour continued with Larry Janzen's 30 acres of direct seeded Pintium beans. Dr. Bert Vandenberg, Dr. Steve Shirtliffe, Dr. Tom Warkentin, and Thandiwe Nleya all of the Uof S were on hand to discuss bean and pea trials throughout the rest of the tour. Questions were asked and answered about everything from seeding methods to harvest of pulse crops. After the tour a barbeque supper was served including Beans as a side dish.

Seager Wheeler Farm Orchard Field Day
August 15,2002

50 people attended the day. Despite the rainy weather, the day was well received. Two experts in fruit production gave talks. These men were also available to answer any questions about fruit production in Saskatchewan. Clarence Peters, who is the provincial fruit crops specialist with SAFRR, centered his talk on Saskatoon and Sea buckthorn production. Rick Sawatzky, who is with plant sciences at the U of S, discussed Dwarf Sour Cherries and Apple production. He also introduced Blue Honeysuckle to the crowd. The afternoon started with an informal question and answer session inside. When the rain let up, the group split in two and moved out to the orchard for a tour and more discussion. One group followed Clarence and the other Rick. The groups then switched in order to hear from both presenters. After the orchard tour coffee and Sour Cherry Platz were served in the main building. Those who were interested stayed for a bud grafting demonstration by Rick Sawatzky. Pamphlets and other information were available for attendees to take home and read over.

Forage Variety Testing Program

Randy Pastl - Forage Coordinator

Summary of the Saskatchewan Forage Variety Testing Program

The Saskatchewan Forage Variety Testing program is a partnership between the Saskatchewan Forage Council (SFC), Agriculture and Agri-Food Canada, AgriARM (AAFC) and the Provincial Council of ADD Boards (PCAB). Funding for the 2002/03-crop year was provided by Saskatchewan Agriculture, Food and Rural Revitalization (SAFRR). Funding for the 1999 to 2001 crop seasons was provided by the Canada/Saskatchewan Agriculture Development Fund (ADF).

Abstract:

This summary of forage cultivar yield data covers the Saskatchewan forage variety testing program from 1999 to 2002 and includes data collected by the SFC and AAFC through funding provided b the ADF. All of the data presented in this paper were collected specifically for new cultivar registration through the "Western Forage Variety Testing Program", in cooperation with AAFC and the three Prairie Provinces.

Alfalfa tended to show the highest yield performance of all species tested, followed by smooth bromegrass, crested wheatgrass and meadow bromegrass. Hybrid bromegrass yields tended to falls between smooth and meadow bromegrass. Under dryland conditions, Kentucky bluegrass yield performance was similar to timothy. However, under irrigation at Outlook, Kentucky bluegrass yield performance was similar to smooth bromegrass. Forage cultivar yields tended to reflect the moisture conditions at each site and indicate the need for forage recommendations to be based on forage data collected from the region nearest to the area of intended forage production. Saskatchewan forage

producers require up to date and accurate forage yield information that reflects the soil and climatic conditions for their region and area of forage production.

Forage yield (when measured by mechanical harvesting) can be a reflection of the forage species morphology and growth characteristics. Meadow bromegrass forage yield is usually lower than smooth bromegrass. However, meadow bromegrass is considered a pasture species with fast regrowth after grazing and basal leaf development. Smooth bromegrass is considered more of a hay production species, but takes much longer to initiate new growth after a harvesting operation. These factors should be considered when interpreting the data. In addition, because the 1999 forage trials have three years of forage yield data associated with them, these trials should receive greater consideration in the interpretations of the results.

New forage trials were sown at Netherhill, Scott, Melfort, Saskatoon, Canora and Prince Albert in 2002. Many of these forage research trials were negatively affected by the sever drought conditions that prevailed in 2002 and a few will have to be re-established in 2003.

The first forage cut was taken when the alfalfa plants at each site were in the late bud to 5% bloom stage of development. At this stage, most earlier forage species like crested wheatgrass were headed out and/or often blooming, while later maturing species like smooth bromegrass or intermediate wheatgrass were in the early to late boot stage of development. Stage of plant maturity is the single most important factor, which determines the quality of forage. In general, as yield increases, neutral detergent fibre (NDF) and acid detergent fibre (ADF), increases. As NDF and ADF increase, intake and digestibility decrease respectively. Producers must balance the forage quality requirements of the herd with the need to maximize forage yield.

The forage plots were supplied with nitrogen (grass only), phosphate, potassium and sulfur fertilizer before seeding and each fall just before winter.

Results:

The mean yields presented in the following tables are calculated weighted means. Much of the detail is lost through such summarizations; however several generalizations and trends can be illustrated. Persons wishing more detailed reporting should refer to the annual report to SAFRR, scheduled for completion toward the end of March 2003.

The data indicate that alfalfa yields were variable within locations and between locations (table 1.1). New experimental lines ranged in yield from 72% to 126% of beaver indicating that there is a significant potential to increase forage yields for forage producers through the introduction of new genetic materials. However, the data also indicate that alfalfa forage yields tend to be site-specific.

Under dryland conditions, the experimental red clover line "ViVi", tended to out yield the check variety Altaswede (table 1.2). Vivi yielded 110% of Altaswede when the data were averaged over all dryland locations. Under irrigated conditions at Outlook, Altaswede and Vivi demonstrated similar forage yield potential.

Under irrigated conditions at Outlook, Carlton smooth bromegrass tended to out performed all other experimental cultivars (table 1.3). However, the two experimental cultivars, LOBF9201 and S-9356 I (hybrid brome) performed consistently and yielded 103 and 102% of Carlton respectively when the data were averaged over all dryland locations.

Kentucky bluegrass experimental line KVER 003, performed quite poorly over all dryland locations compared to the check cultivar troy (Table 1.4). However, Kentucky bluegrass performed much better than alfalfa, and as good as smooth bromegrass under irrigation at Outlook (table 1.7).

Climax timothy tended to out perform all experimental cultivars when compared under irrigation at Outlook (table 1.5). However, under dryland conditions, experimental lines BOR94372, BOR94374 and PCQX-39 tended to yield 108, 108 and 105% of climax, respectively, when compared over locations. Once again, this indicates that forage cultivar yield performance can be very site specific and producers will require accurate information in order to select the proper forage variety for their forage production system.

Kirk crested wheatgrass significantly out-performed both experimental lines (Douglas and Vavilov) when compared within locations, over locations and by soil climatic zone (table 1.6). Once again, this illustrates the importance of testing new forage cultivars for merit under Saskatchewan soil climatic conditions.

Under dryland conditions, alfalfa tended to perform much higher relative to the grass species and cultivars tested. However, the forage grass species tended to out-perform alfalfa under irrigated conditions at Outlook (table 1.7). Altaswede clover, Kirk crested wheatgrass, Carlton smooth bromegrass and Kentucky bluegrass yielded 120, 133, 132 and 132% of alfalfa under irrigation, respectively. Perennial forage grass species tend to be much more shallow rooted than the legumes (practically Alfalfa) and will become dormant under the draught conditions that prevailed at Netherhill and Swift Current in 2001 and Saskatoon and Netherhill in 2002. The data also indicate that some of the shallow root grass species like timothy and Kentucky bluegrass (which require high fertility and moisture regimes) were much more severely affected by the drought conditions at these locations.

Conclusions:

In general, alfalfa tended to out yield the grass forage species at each site and when averaged over locations. "ViVi" red clover tended to out yield the check variety Altaswede. The two experimental brome cultivars, LOBF9201 and S-9356 I (hybrid

brome) performed the most consistently when compared to Carlton smooth bromegrass. The experimental Kentucky bluegrass line KVER 003 performed quite poorly when compared to troy. Under dryland conditions, the experimental timothy lines BOR94372, BOR94374 and PCQX-39 tended to yield 108, 108 and 105% of climax when compared over locations. The data indicate that forage yield varied between locations and soil zones. Therefore, forage recommendations should be based on data collected from each soil climatic zone. Saskatchewan forage producers require up to date and accurate forage yield information that reflects the soil and climatic conditions for their region and area of intended forage production. Generally, forage species and cultivar yield performance was site specific.

Yield Data From the 1999 Sown Western Forage Variety Clover Trials
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone

There is three years of data for each site unless otherwise indicated.

Year	# Years	Species	Outlook		Saskatoon		Nipawin		Tisdale		Canora		*Swift Current		*Netherhill		Dryland		Black
			(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/Ha)	% Beaver	(Kg/H
1999	3	3030	12935	105	4380	107	-		5961	95	7660	81	-		2679	87	5668	88	457
1999	3	4241	11663	95	3721	76	-		5606	90	8265	87	-		2858	93	5563	86	465
1999	3	2065 MF	13544	110	4183	77	-		6022	96	8207	87	-		2568	83	5780	90	477
1999	3	ANCHOR	12367	100	4398	110	-		5499	88	9462	100	-		2791	91	6087	94	501
1999	**3**	**BEAVER**	**12315**	**100**	**4771**	**100**	**-**		**6250**	**100**	**9458**	**100**	**-**		**3077**	**100**	**6451**	**100**	**526**
1999	3	C227	12201	99	4069	96	-		5888	94	8294	88	-		2822	92	5757	89	475
1999	3	C304	13202	107	4002	84	-		5601	90	8505	90	-		2445	79	5677	88	473
1999	3	CW 4223	13329	108	4446	87	-		5295	85	10250	108	-		3817	124	6379	99	521
1999	3	CW 6408	13134	107	4283	94	-		5836	93	10869	115	-		3699	120	6666	103	560
1999	3	DS 9923	12992	105	3434	86	-		5946	95	8701	92	-		3636	118	5788	90	491
1999	3	DS 9924	13656	111	4394	85	-		5847	94	8984	95	-		2656	86	6033	94	497
1999	3	DS 9925	12487	101	4427	92	-		5989	96	8551	90	-		3380	110	6028	93	487
1999	3	DS 9927	12378	101	4037	88	-		5656	90	9141	97	-		3215	105	5972	93	496
1999	3	DS 9928	12679	103	4098	98	-		5422	87	8806	93	-		3029	98	5801	90	477
1999	3	DS 9929	11700	95	3943	100	-		5904	94	9264	98	-		3182	103	6051	94	508
1999	3	GENEVA	12598	102	3825	86	-		5562	89	9820	104	-		2295	75	5992	93	515
1999	3	GIBRALTAR	13043	106	4034	96	-		5829	93	7606	80	-		2743	89	5515	85	450
1999	3	R922	13017	106	3713	91	-		6002	96	9713	103	-		2219	72	6050	94	521
1999	3	R923	13551	110	4086	80	-		5535	89	8905	94	-		2649	86	5823	90	484
1999	3	RAMBLER	13842	112	3685	71	-		5968	95	7715	82	-		3130	102	5523	86	459
1999	3	SL 9900	12429	101	4222	104	-		5533	89	9962	105	-		3199	104	6235	97	519
1999	3	SL 9901	13686	111	4484	92	-		5405	86	9831	104	-		3351	109	6251	97	519
1999	3	SI 9902	13823	112	4732	95	-		5409	87	10689	113	-		3588	117	6608	102	535
1999	3	ZG 9831	12894	105	4077	105	-		5600	90	11067	117	-		3868	126	6610	102	558
2000	2	3008	11523	102	4358	113	6836	75			7670	94	5269	83	1957	111	5720	87	767
2000	2	9603	11898	105	4273	118	7964	87			8854	109	5020	79	1795	102	6163	94	88
2000	2	54V54	11666	103	4210	119	7456	82			9225	113	5283	83	1371	78	6146	94	92
2000	2	AC BLUEJAY	11092	98	4107	116	7567	83			8332	102	5718	90	1428	81	6046	92	83
2000	**2**	**BEAVER**	**11293**	**100**	**4208**	**100**	**9113**	**100**			**8144**	**100**	**6383**	**100**	**1759**	**100**	**6582**	**100**	**814**
2000	2	CW73038	11504	102	4216	111	9201	101			9279	114	6235	98	1716	98	6808	104	927
2000	2	DK124	12363	109	4004	103	7395	81			8805	108	5547	87	2116	120	6105	93	88
2000	2	DK134	11761	104	3961	99	8285	91			9408	116	6112	96	1711	97	6539	100	94
2000	2	DS027-BY	11962	106	3779	101	8382	92			8720	107	5802	91	1885	107	6302	96	87
2000	2	DS028-BY	11818	105	3947	100	9151	100			9492	117	5861	92	1893	108	6711	102	949
2000	2	DS029-BY	11372	101	4153	116	7825	86			9375	115	5210	82	1710	97	6262	95	937
2000	2	DS030-BY	12353	109	4336	115	7902	87			9590	118	5919	93	1909	109	6550	100	95
2000	2	DS2000	11109	98	4183	106	8260	91			8432	104	6378	100	1943	110	6439	98	84
2000	2	DS380-BY	11297	100	3868	95	8041	88			9540	117	5939	93	2082	118	6485	99	95
2000	2	EX101	11793	104	4036	107	8138	89			8703	107	5787	91	2021	115	6309	96	870
2000	2	RAMBLER	10990	97	4617	115	8160	90			8814	108	6285	98	2027	115	6589	100	881
2000	2	RANGELANDER	11016	98	4341	116	8794	97			8772	108	5968	93	2178	124	6600	101	87
Weighted		**Beaver**	**11906**	**100**	**4546**	**100**	**9113**	**100**	**6250**	**100**	**8932**	**100**	**6383**	**100**	**1759**	**100**	**6496**	**100**	**64**
Means		Over Other	12869	107	4255	100	8085	89	5709	91	9416	105	5771	90	2553	102	6310	89	652

*Note only one year of data for these two locations.

Table 1. 1 1999 Clover Trials

Yield Data From the 1999 Sown Western Forage Variety Clover Trials
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone
There is three years of data for each site unless otherwise indicated.

s	Outlook Irrigation (kg/ha)	% Altaswede	*Saskatoon DrB (kg/ha)	% Altaswede	Nipawin Gray/Bl (kg/ha)	% Altaswede	Tisdale Bl (kg/ha)	Canora Bl (kg/ha)	% Altaswede	Swift Current B (kg/ha)	*Netherhill B (kg/ha)	% *Altaswede	Dryland (kg/ha)	% Altaswede	black (kg/ha)	% Altaswe
SWEDE	**14304**	**100**	**3579**	**100**	**4709**	**100**	-	**10772**	**100**	-	**2410**	**100**	**5367**	**100**	**7740**	**100**
RA	13381	94	2308	64	4607	98	-	10915	101	-	1584	66	4853	90	7761	100
222	13382	94	1948	54	4134	88	-	9656	90	-	946	39	4171	78	6895	89
29	12282	86	2049	57	5916	126	-	9396	87	-	1433	59	4698	88	7656	99
RED)	13729	96	4275	119	5175	110	-	11496	107	-	2631	109	5894	110	8335	108
							-			-						
veda	**14304**	**100**	**3579**	**100**	**4709**	**100**	-	**10772**	**100**	-	**2410**	**100**	**5367**	**100**	**7740**	**100**
	13193	92	2645	74	4958	105	-	10366	96	-	1648	68	4904	91	7662	99

: DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones; B = Brown Soil/climatic Zone.
ear of Data only

Table 1. 2 1999 Bromegrass Trials

Mean Yield Data From the 1999 Sown Western Forage Variety Bromegrass Trials
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone
There is three years of data for each site unless otherwise indicated.

pecies	Outlook (Kg/Ha)	% Carlton	Saskatoon (Kg/Ha)	% Carlton	Nipawin (Kg/Ha)	% Carlton	Tisdale -	Canora (Kg/Ha)	% Carlton	Swift Current (Kg/Ha)	% Carlton	Netherhill (Kg/Ha)	% Carlton	dryland (Kg/Ha)	% Carlton
ARLTON	**15747**	**100**	**4626**	**100**	**7548**	**100**	-	**6462**	**100**	**1834**	**100**	**1887**	**100**	**3953**	**100**
LEET	14517	92	4301	93	6312	84	-	5584	86	2420	132	1515	80	**3449**	87
OBF9201	15389	98	4332	94	7618	101	-	6777	105	1966	107	1625	86	**4072**	103
OBF9202	15044	96	4654	101	6780	90	-	6327	98	1749	95	1531	81	**3707**	94
4B-A	15319	97	3909	84	6462	86	-	5635	87	2324	127	1571	83	**3354**	85
9356 I	14353	91	4440	96	7282	96	-	7058	109	2049	112	1966	104	**4046**	102
							-								
arlton	**15747**	**100**	**4626**	**100**	**7548**	**100**	-	**6462**	**100**	**1834**	**100**	**1887**	**100**	**3953**	**100**
leet	14517	92	4301	93	6312	84	-	5584	86	2420	132	1515	80	3449	87
verall	15026	95	4334	94	7036	93	-	6449	100	2022	110	1673	89	3795	96

otes: DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones; B = Brown Soil/climatic Zone.

Table 1. 3 1999 Kentucky Bluegrass Trials

Mean Yield Data From the 1999 Sown Western Forage Variety Kentucky Bluegrass Trials
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone
The data represent three site-years of data unless otherwise indicated

cies	Outlook Irrigation (Kg/Ha)	% Troy	Saskatoon DrB -	*Nipawin Gray/Bl (Kg/Ha)	% Troy	Tisdale Bl -	*Canora Bl (Kg/Ha)	% Troy	Swift Current B (Kg/Ha)	% Troy	Netherhill B -	Overall (Kg/Ha)	% Troy	Dryland (Kg/Ha)	% Troy	Black (Kg/Ha)	% Troy
DY	**15697**	**100**	-	**3024**	**100**	-	**3942**	**100**	**3039**	**100**	-	**642[illegible]**	**100**	**4108**	**100**	**3483**	**100**
ER 003	14642	93	-	2263	75	-	2635	67	1389	46	-	5[illegible]	81	2880	70	2449	70

es: DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones; B = Brown Soil/climatic Zone.
ly two years of data for these two locations.

Table 1. 4 Timothy Variety Trials

Mean Yield Data From the Western Forage Variety Timothy Trials
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone

There is three years of data for each site unless otherwise indicated.

ır	#years	Species	Outlook		Saskatoon		Nipawin		Canora		Swift Current		Dryland		Black	
			(Kg/Ha)	% Climax	(Kg/Ha)	% Climax	(Kg/Ha)	% Climax	(Kg/Ha)	% Climax	(Kg/Ha)	% Climax	(Kg/Ha)	% Climax	(Kg/Ha)	% Climax
)9	**3**	**CLIMAX**	**8190**	**100**	**-**	**-**	**-**	**-**	**5204**	**100**	**3164**	**100**	**4184**	**100**	**5204**	**100**
)9	3	GPT 18905	6980	85	-	-	-	-	5099	98	2680	85	3889	91	5099	98
)9	3	GPT 18906	7265	89	-	-	-	-	5187	100	2525	80	3856	90	5187	100
)0	2	BOR94372	8294	88	1593	112	4000	123	4070	101	3005	100	3167	108	4035	112
)0	2	BOR94374	8452	89	1688	119	3884	120	4160	103	3009	100	3185	108	4022	111
)0	**2**	**CLIMAX**	**9463**	**100**	**1423**	**100**	**3248**	**100**	**4036**	**100**	**3063**	**102**	**2943**	**100**	**3642**	**100**
)0	2	MOTIM	8742	92	979	69	3484	107	4364	108	2249	75	2769	94	3924	108
)0	2	PBQX-1	9307	98	1123	79	3536	109	3731	92	2367	79	2689	91	3634	101
)0	2	PCQX-39	9305	98	1200	84	4254	131	4281	106	2611	87	3086	105	4267	119
ighted		**Climax**	**8699**	**100**	**1423**	**100**	**3248**	**100**	**4737**	**100**	**3124**	**101**	**3688**	**100**	**4579**	**100**
ans		Over Other	8183	91	1316	92	3832	118	4504	101	2631	86	3314	97	4414	106

es: DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones; B = Brown Soil/climatic Zone.

Table 1. 5 1999 Crested Wheatgrass

Yield Data From the 1999 Western Forage Variety Crested Wheatgrass Trials
Total Cultivar Yield by Location, Across Locations and By Soil Zone

ecies	Outlook Irrigation (Kg/Ha)	% Kirk	Saskatoon DrB (Kg/Ha)	% Kirk	Nipawin Gray/Bl (Kg/Ha)	% Kirk	Swift Current B (Kg/Ha)	% Kirk	Netherhill B (Kg/Ha)	% Kirk	Dryland (Kg/Ha)	% Kirk	brown (Kg/Ha)	% Kirk
)UGLAS	11467	72	3141	32	3917	54	1380	64	1272	51	2427	57	1326	57
RK	**15832**	**100**	**5116**	**100**	**7259**	**100**	**2154**	**100**	**2490**	**100**	**4255**	**100**	**2322**	**100**
VILOV	13747	87	4264	83	4669	64	2096	97	2050	82	3270	77	2073	89
k	**15832**	**100**	**5116**	**100**	**7259**	**100**	**2154**	**100**	**2490**	**100**	**4255**	**100**	**2322**	**100**
ıer CWG	12607	80	3702	57	4293	59	1738	81	1661	67	2848	67	1699	73

tes: DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones; B = Brown Soil/climatic Zone.
VG = Crested wheatgrass

Table 1. 6 Species Comparison using Weighted means over Years, Trials and Locations.

Species Weighted Yield Data From the Western Forage Variety Trials (1999 to 2002)
Showing the Total Cultivar Yield by Location, Across Locations and By Soil Zone

There is three years of data for each site unless otherwise indicated

es	Outlook Irrigation (Kg/Ha)	% Beaver	Saskatoon DrB (Kg/Ha)	% Beaver	Nipawin Gray/Bl (Kg/Ha)	% Beaver	Tisdale Bl (Kg/Ha)	% Beaver	Canora Bl (Kg/Ha)	% Beaver	Swift Current B (Kg/Ha)	% Beaver	Netherhill Bl (Kg/Ha)	% Beaver	**Dryland (Kg/Ha)	% Beaver	***Brown (Kg/Ha)	% Beaver
	11906	**100**	**4546**	**100**	**9113**	**100**	**6250**	**100**	**8932**	**100**	**6383**	**100**	**1759**	**100**	**6496**	**100**	**4071**	**100**
: Alfalfa	12869	108	4255	94	8085	89	5709	91	9416	105	5771	90	2553	145	6310	97	4162	102
vede	14304	120	3579	79	4709	52	-	-	10772	121	-	-	2410	137	5367	83	2410	59
Clover	13193	111	2645	58	4958	54	-	-	10366	116	-	-	1648	94	4904	75	1648	40
	15832	133	5116	113	7259	80	-	-	-	-	2154	34	2490	142	4255	66	2322	57
Crested Wheatgrass	12607	106	3702	81	4293	47	-	-	-	-	1738	27	1661	94	2848	44	1699	42
ix	8699	73	1423	31	3248	36	-	-	4737	53	3124	49	-	-	3688	57	3124	77
r Timothy	8183	69	1316	29	3832	42	-	-	4504	50	2631	41	-	-	3314	51	2631	65
	15747	132	4626	102	7548	83	-	-	6462	72	1834	29	1887	107	3953	61	1861	46
	14517	122	4301	95	6312	69	-	-	5584	63	2420	38	1515	86	3449	53	1968	48
Bromegrass	15026	126	4334	95	7036	77	-	-	6449	72	2022	32	1673	95	3795	58	1848	45
	15697	132	-	-	3024	33	-	-	3942	44	3039	48	-	-	4108	63	3039	75
r Kentucky Bluegrass	14642	123	-	-	2263	25	-	-	2635	30	1389	22	-	-	2880	44	1389	34
OF BEAVER	**11906**	**100**	**4546**	**100**	**9113**	**100**	**6250**	**100**	**8932**	**100**	**6383**	**100**	**1759**	**100**	**6496**	**100**	**4071**	**100**
OTHER SPECIES	13443	113	3530	78	5214	57	5709	91	6487	73	2612	41	1980	113	4073	63	2342	58

. DrB = Dark Brown Soil/Climatic Zone; Gray/Bl = Gray-wooded and Black soil climatic zones, B = Brown Soil/climatic Zone
ghted means of all other entries in the individual trials
over all sites except the data from the irrigated sites
otes the mean of the data averaged over the Swift Current and Netherhill sites and indicates the Brown Soil/Climatic Zone
otes the means of the data averaged over the Nipawin, Tisdale and/or Canora sites and indicates the Gray-wooded and Black Soil/Climatic Zone